AUGUST, 1961

Modern Metals

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They'll Find a Ready-Made Market in the Aluminum Industry

New materials such as specially bonded silicon carbide, fused alumina, mullite, zircon, alumina bubbles and fibrous ceramics can improve performance of reduction cells, anode baking ovens, melting and holding furnaces, and equipment for handling molten aluminum.

(See report, "Special Refractories for Aluminum," page 32.)

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in
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Tools

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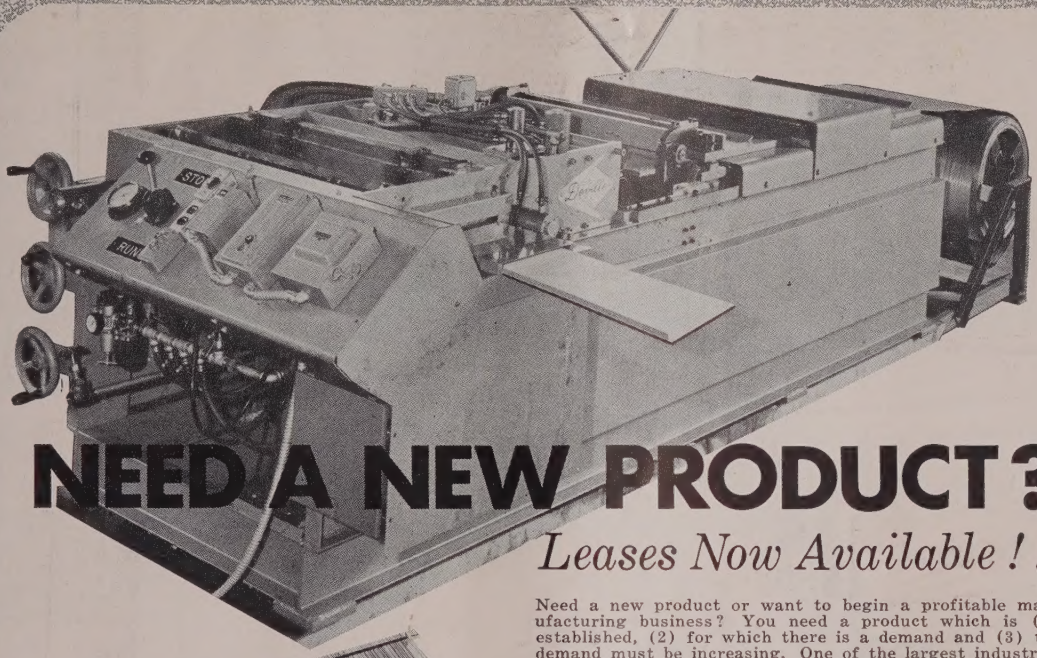


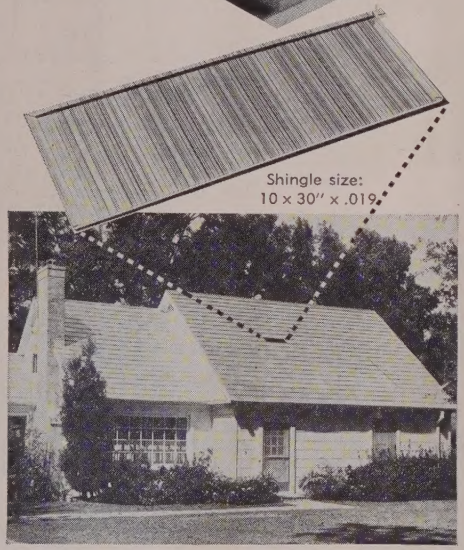
NEED A NEW PRODUCT?

Leases Now Available ! !

Need a new product or want to begin a profitable manufacturing business? You need a product which is (1) established, (2) for which there is a demand and (3) the demand must be increasing. One of the largest industries in the world today is home building . . . consequently, building supplies are in great demand. Of all such supplies, roofing and siding are probably the most noticed and carefully picked. They must be durable, heat reflective, attractive and easily installed.

Now, **you** can manufacture the best of all roofing and siding shingles. The Deville machines will manufacture approximately one square (48 shingles) per minute. They are 4-way interlocking, 10 x 30″ and require only one nail for installation. The shingles are striated, suggestive of a wood shake shingle, which makes the roof glare-proof, and are available in a wide selection of colors. They reflect 95% of the radiant heat which strikes the surface and generates less than a decibel more sound than a conventionally shingled roof. . . . The Deville shingles weigh 40 lbs. per square compared to 210 to 315 for asphalt shingles.

Demand for this shingle is growing. Already it is being used by a major pre-fab home builder. Numerous contractors throughout the U. S. and Foreign countries are using it for new housing and re-roofing and siding. **Now** is the time to enter this field! Begin while the product is young and take advantage of the growing demand. The Deville Automatic Aluminum shingle machine may be obtained from International Aluminum on a Lease-Royalty Basis. Just complete the coupon below and send it to International Aluminum Co., P. O. Box 3035, Baton Rouge, La., or call ELgin 7-7527 for more information on this great oportunity.



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Special Features

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- Not resonant . . . rain generates less than one decibel more sound.
- Heat . . . reflects 95% of radiant heat.
- Installation . . . Installation time, 20 minutes per square.
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- DEMAND INCREASING and leases for the machine are **available now!**

INTERNATIONAL ALUMINUM CORPORATION

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INTERNATIONAL ALUMINUM
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Please rush me complete information on how I may lease the Deville Shingle Machine.

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PITTSBURGH 22, PENNSYLVANIA

How to bond aluminum with structural adhesives

The many advantages of adhesive bonding of aluminum should be considered where low cost, lightweight, smooth surface assemblies are needed. Greatly improved structural adhesives make this method of bonding practical and economical when riveting, welding, brazing, or mechanical fastening is difficult or prohibitively expensive.

APPLICATIONS

Aluminum can be bonded with adhesives to itself, and to fabric, foil, plastic, rubber, ceramics, cork, glass, leather, paper, wood, and other metals. Some typical aluminum products which have been adhesive bonded are crossmembers in box cars; sandwich panels with honeycomb cores and aluminum skins; louvers and awnings; portable poster signs; beach umbrellas; curtain wall construction with aluminum corrugated cores; evaporator and condenser joints; aircraft fuselages and structural members.

ADVANTAGES

1. Adhesive bonding usually costs less.
2. Stress loads are distributed over the entire jointed area to permit use of lighter gauge metal.
3. Most adhesives tend to absorb vibration or shock.
4. Some adhesives provide a continuous joint seal impervious to gases and liquids.
5. Some adhesives act as electrical insulators, others as conductors.
6. Joints are smooth.
7. The original strength of the joined members is retained because fastener holes are eliminated.
8. There is no need for excessive heat (as used in welding and brazing) which can weaken the joint and cause buckling and warping.
9. There is no danger of unremoved flux which can cause corrosion.

JOINT DESIGN

The joints should be *specifically designed* for adhesive bonding. Shear loaded joints are the most efficient and reliable. But since most joints are subject to a combination of tensile, cleavage, peel, and shear loading, all the stress involved in the end use of the joint should be evaluated when designing the joint and selecting the adhesive.

BONDING ADHESIVES

Various types of proprietary adhesives that will give satisfactory bonds with aluminum are available. Proper selection requires evaluation of the properties of these adhesives and the requirements of the specific application. Commonly used adhesives include:

1. Natural and synthetic rubbers.
2. Polyvinyl acetates.
3. Alkyd, epoxy and phenolic resins.
4. Phenolics and epoxys modified by vinyl and phenol additions.
5. Epoxys and polysulfides.

Neoprene-base adhesives of the chemically cured types, although not classified as "structural," also offer good, all-around properties for certain applications.

APPLYING ADHESIVES

Usually solvent degreasing is all that is necessary for a satisfactory joint. If surfaces have a heavy oxide coating, wire brushing or sand blasting may be required. For maximum joint strength aluminum should be cleaned with a chromic-sulfuric acid bath.

Phenolic resin films are supplied in rolls. They are cut to desired lengths and laid between parts to be joined. Then heat and pressure are applied.

Epoxy adhesives may be applied by roller coating, caulking gun, brush, putty knife, or spray nozzle.

The use of jigs or presses to hold the bonded parts is usually required. Where heat and higher pressures are needed, the fixtures may be placed in ovens or autoclaves, or a press with heated platens may be used.

There are still many applications where only brazing, welding, riveting, or mechanical fastening will do the job. However, adhesive bonding has opened many new fields for aluminum application. With intelligent selection and use, adhesives provide an effective tool for joining aluminum parts.

The above information is from the Reynolds Metals Company technical handbook, "Adhesive Bonding of Aluminum." For a copy of this valuable booklet, see the next page.

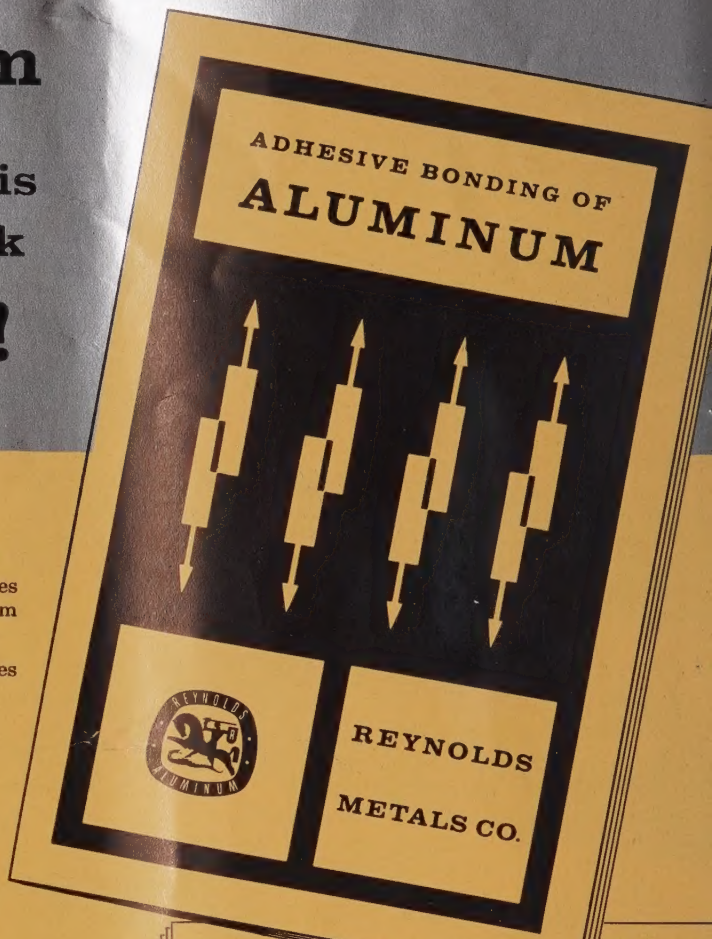
And, to be sure you get the right aluminum
—use Reynolds Aluminum

FREE booklet—"Adhesive Bonding of Aluminum"—see next page

Adhesive Bonding of Aluminum

Get your copy of this Reynolds handbook

FREE!

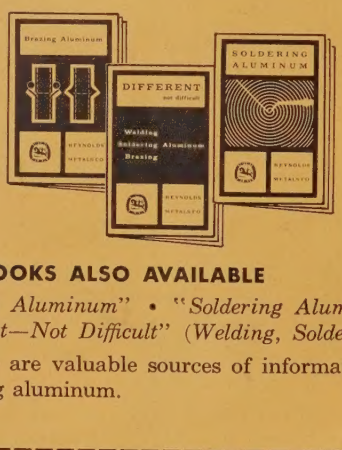


Round Out Your Aluminum Know-How With This Guide to Adhesive Bonding of Aluminum

Authoritative, concise, clearly written, it describes the advantages of adhesive bonding of aluminum in detail:

- joint design • loading stress • types of adhesives
- selection of adhesives for aluminum
- strength range of adhesives
- pretreatment • methods of application
- curing • typical applications

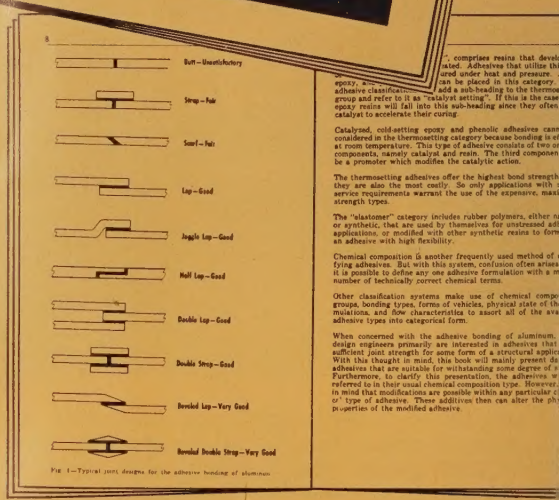
A valuable aid to every designer, engineer, and production man working with aluminum. It's yours free with the coupon below. And remember, Reynolds design and engineering specialists are always at your service.



HANDBOOKS ALSO AVAILABLE

"Brazing Aluminum" • *"Soldering Aluminum"*
"Different—Not Difficult" *(Welding, Soldering, Brazing)*

All three are valuable sources of information on methods of joining aluminum.



Reynolds Metals Company
P.O. Box 2346-GM, Richmond 18, Virginia

Send me the Reynolds handbooks I have checked below:

☐ Adhesive Bonding of Aluminum ☐ Soldering Aluminum
☐ Brazing Aluminum ☐ Different—Not Difficult

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*Firm*_____

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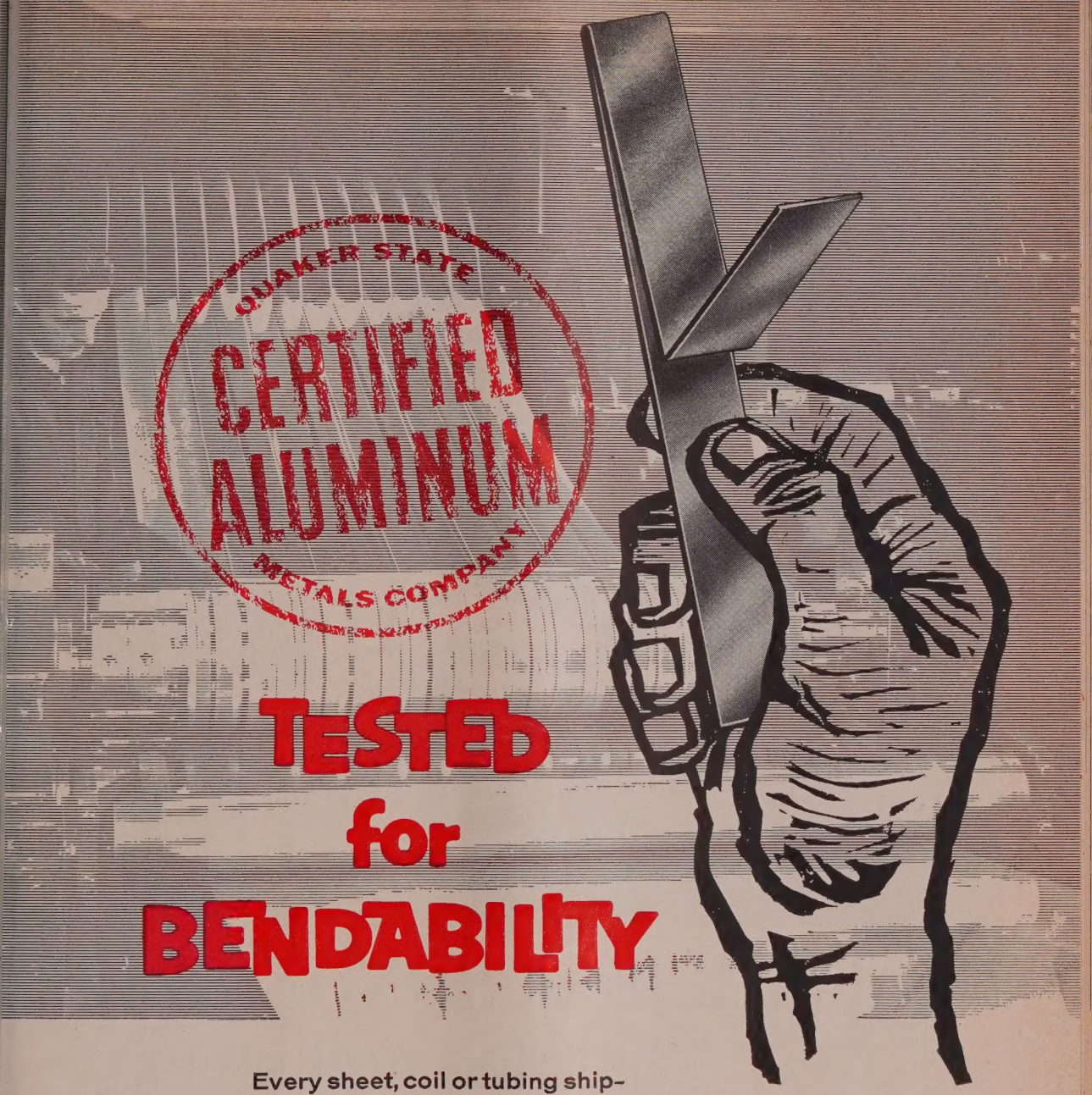
Watch Reynolds TV show "Harrigan & Son," Fridays—ABC-TV



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Modern Metals
Read in companies that produce, fabricate and cast aluminum, magnesium and titanium, and firms that use these metals in manufacturing end products.

N THE COVER: Like many other industries today, the refractories business is ssing through a period of technological vances. And the new and improved maials being developed by refractories oducers are sure to benefit the metalrking industry. An example is the Fiberax ceramic fiber paper shown on the ver. Formed into tubular stock, Carrundum's new material is used for mplete molten metal piping or trough stems for nonferrous casting operations. r more on this important subject, see the ticle starting on page 32.

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Modern Metals is published monthly by Modern Metals Publishing Co., not incorporated, at Barrington, Ill. Printed in U.S.A. Subscription in the United States: To fabricators and users of light metals—$3.00 one year; $5.00 two years; $6.00 three years. To all others in U.S.—$10.00 per year. Foreign $10.00 one year; $16.00 two years; $22.00 three years. Back issues: $1.00 each.
Modern Metals has by far the world's largest circulation among light metals fabricators, foundries and product manufacturers who use aluminum, magnesium, and titanium. Circulation: now over 15,000 copies per month. Acceptance under controlled circulation at Barrington, Ill.

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PUBLISHER W. B. GRIFFIN

Modern Metals

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SIDING MAKERS EYE HOME BUILDING BUSINESS H. K. Darby **28**
Alside, Inc. has unveiled its ultra-modern prefab; is building a plant to manufacture it. U. S. Aluminum Siding is blueprinting a model for eventual manufacture. Both will make extensive use of aluminum.

SPECIAL REFRACTORIES FOR ALUMINUM W. L. Peskin **32**
Critical properties, characteristics, present and potential application of silicon carbides, aluminas, mullite, zircon, bubble and fibrous ceramics are detailed.

MIG-WELDED DUMP TRUCK **44**
Welded aluminum dump truck saves asbestos company time and money in transporting ore from mill to mill.

FURNACES PROVIDE ACCURATE ANNEALING **48**
New furnace installation at Reynolds' Sheffield plant gives precise control, speedy loading and unloading advantages.

EXPLOSIVE FORMING RADAR REFLECTORS **52**
New technique requires minimum tooling but provides fast, close tolerance production.

ALUMINUM'S PACKAGING GOAL **54**
Modern Metals visited recent packaging show; was told foil-paper cans, ends, other foil packaging ideas would lead way toward packagers using 470 million pounds of aluminum by 1965.

DOUBLE DUTY ANALYZER **56**
Direct reading spectrograph makes high-speed determinations with conventional heads; is adaptable for photographic analysis.

DEEP DRAWING MAGNESIUM E. V. Crane **58**
Magnesium Association Meeting paper details results of experiments which proved that magnesium sheet can be drawn on mechanical presses at higher speeds than on hydraulic presses.

PLYWOOD + ALUMINUM W. E. Poitras **64**
A new industrial material, created by bonding flexible plywood to metal sheet, can be fabricated like metal.

ALUMINUM CURTAIN WALLS TO GAIN **66**
Olin Aluminum survey forecasts use of aluminum to show steady increase in curtain wall construction.

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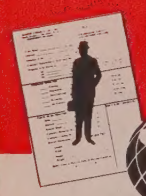

Your local Magnus Representative will survey and recommend — without obligation — methods to speed, improve and cut costs in your individual operation.

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Please send FREE case histories and survey form.

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Letters

Anodized Vacuum Die Castings

Sirs:

Would it be possible to obtain two reprints of the article appearing on page 58 of your June, 1961 issue, entitled, "Vacuum Process Produces Super Purity Die Castings That Can Be Anodized"?

"L"—Ohio

MM—Tear sheets have been sent.

Aluminum for Sprinklers

Sirs:

In case we should go to aluminum for our castings, how long and what is the best protection for soil and water contact? We now have a special plating for our zinc sprinkler heads, and, under actual field conditions, have been in the ground for eight years. Can we get this protection from aluminum?

"J"—California

MM—Here is another case of the age-old problem: A firm interested in using aluminum castings, but hasn't got adequate information concerning aluminum's (or magnesium's) resistance to corrosion.

Any reader want to contact "J"? We'll forward all replies.

The Extrusion Industry

Sirs:

You really spelled out the ills of the aluminum extrusion industry in your July issue. Here at our company, we think your report has done more to help straighten out their thinking than anything else this year.

"R"—Ohio

MM—Many thanks. We've received lots of comments, pro and con, about our expose of extrusion industry problems. Only the extruders themselves can solve the problems. One thing that would help is a concerted industry-wide campaign to develop new markets. This should have been done years ago — but it's not too late to start now.

Curtain Walls: Aluminum or Stainless?

Sirs:

We read with interest your paragraph: "Curtain wall business has boiled down to a battle between aluminum producers and stainless steel outfits. The resulting stiff price competition has all but squeezed many independent architectural fabricators out of the business." (MM, June '61, p. 106.)

We are in the curtain wall business and are at a loss to understand how you could possibly have come to your conclusion. Certainly less than 1% of the curtain wall jobs use stainless steel. Furthermore, almost every stainless steel project which we are familiar with was put up for an owner in the stainless steel business or in the business of furnishing raw materials for stainless steel.

These would include the U. S. Steel projects in Pittsburgh, and Union Carbide Building in New York. Another large project, the Socony Mobiloil Building in New York City, was heavily subsidized by the steel companies.

In our opinion, stainless steel is far more costly and far less capable of satisfying architectural design requirements than

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EEP WELLS OR SUMPS . . .

apidayton Pumps by Tait use op-quality tube by Wolverine

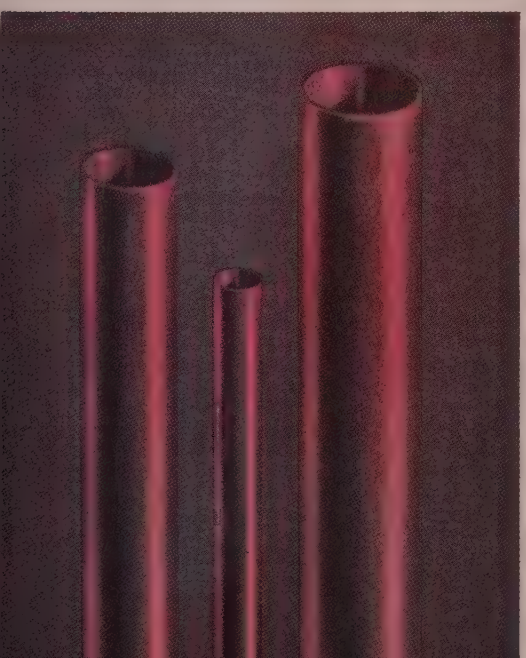
a farmer pumping water from a 100-foot deep well, to the owner of a flood-prone basement, such things quality, stamina and dependability are highly desirle features in the pumps they use.

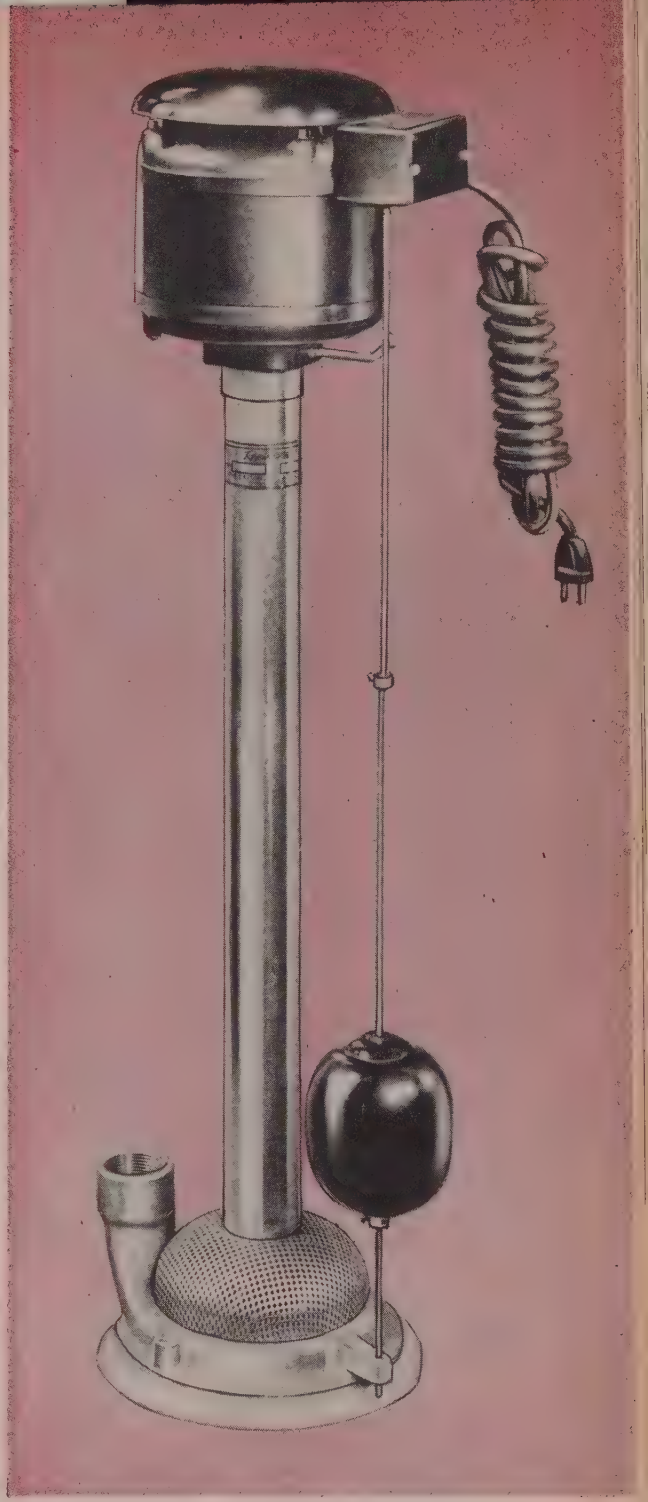
That's why Tait Manufacturing Company, Dayton, nio is so careful of the components it uses in its Rapidayton" line of submersible and jet water sysns and basement sump pumps. It's the reason, too, at Tait uses seamless brass and aluminum tubing anufactured by Wolverine Tube, Division of Calumet Hecla, Inc.

For example, to resist corrosion, the critically imrtant outer jackets of Rapidayton submersible mps for both shallow and deep well use are formed m Wolverine soft annealed 2 and 1 low-leaded brass be. Tait also uses thousands of feet of Wolverine lf-hard 70-30 brass tube and 3003-H14 drawn uminum tube for riser pipes on its Rapidayton Upht Cellar Drainers.

If your company uses seamless copper, copper alloy aluminum tubing why not follow the lead of Tait d other American manufacturers—specify Wolverine.

Write, too, for a free copy of the Wolverine Tubeanship Book.





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★ Brass Tube

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PHONE: CL 4-6191

aluminum. Now that stainless has gone up in price, its use will probably become even more restricted.

"L"—Pa.

MM—Maybe we're the victims of all that potent propaganda the steel outfits are dishing out these days, but we were under the impression that the ferrous stuff is used more widely than your letter indicates. Here in Chicago, for example, stainless grabbed the big Executive House hotel project. Aluminum seems to be sitting pretty in the curtain wall business, according to Olin's recent survey (see page 66). But watch out for precast concrete curtain walls such as those used in the new Water Tower Inn on Chicago's near north side. This is a development to keep an eye on.

Available: Ten Years Of Back Issues

Sirs:

I have available copies of Modern Metals as indicated on the attached list. If any of your subscribers have need for these back copies, I will be willing to send them at no charge except for the postage.

As you will note, the series from November 1945 through July 1956 is complete, and I would prefer to ship this to anybody who desires a complete file.

"P"—Calif.

MM—We regularly get requests for issues dating back as far as 1945, but usually cannot fill them because our supply is down to the legal minimum. Here's a rare opportunity to pick up some "collectors items." Our thanks to veteran subscriber, Mr. "P."

Big Permold Casting

Sirs:

We would like to order 12 reprints of the article entitled: "Mower Rides on Big Multi-Purpose Permanent Mold Casting." (MM, June '61, p. 50.) Please forward these to my attention . . .

"F"—N.Y.

MM—The article was not reprinted, but we have sent you all the tear sheets we have. The story concerned the chassis casting of Porter-Cable's Mark 24 riding mower.

Ladders and Subscriptions

Sirs:

We were very much interested in your letters column item which was signed: "C"—Isle of Man. We would appreciate learning where we can contact the gentleman.

By the way, we still read your magazine from cover to cover, including the ads. It is the only trade magazine for which we are happy to pay a subscription fee. The rest of them come in "for free" and there are many of them.

"M"—Calif.

MM—The man on the Isle of Man wanted to know the relative merits of importing aluminum ladders or manufacturing them. We have forwarded your letter to him.

As for subscriptions, we are still plugging away at them — and each year we gain a little over the preceding one. Right now, our circulation is at an all-time high, despite the fact that nearly every other industrial magazine has gone to free circulation.

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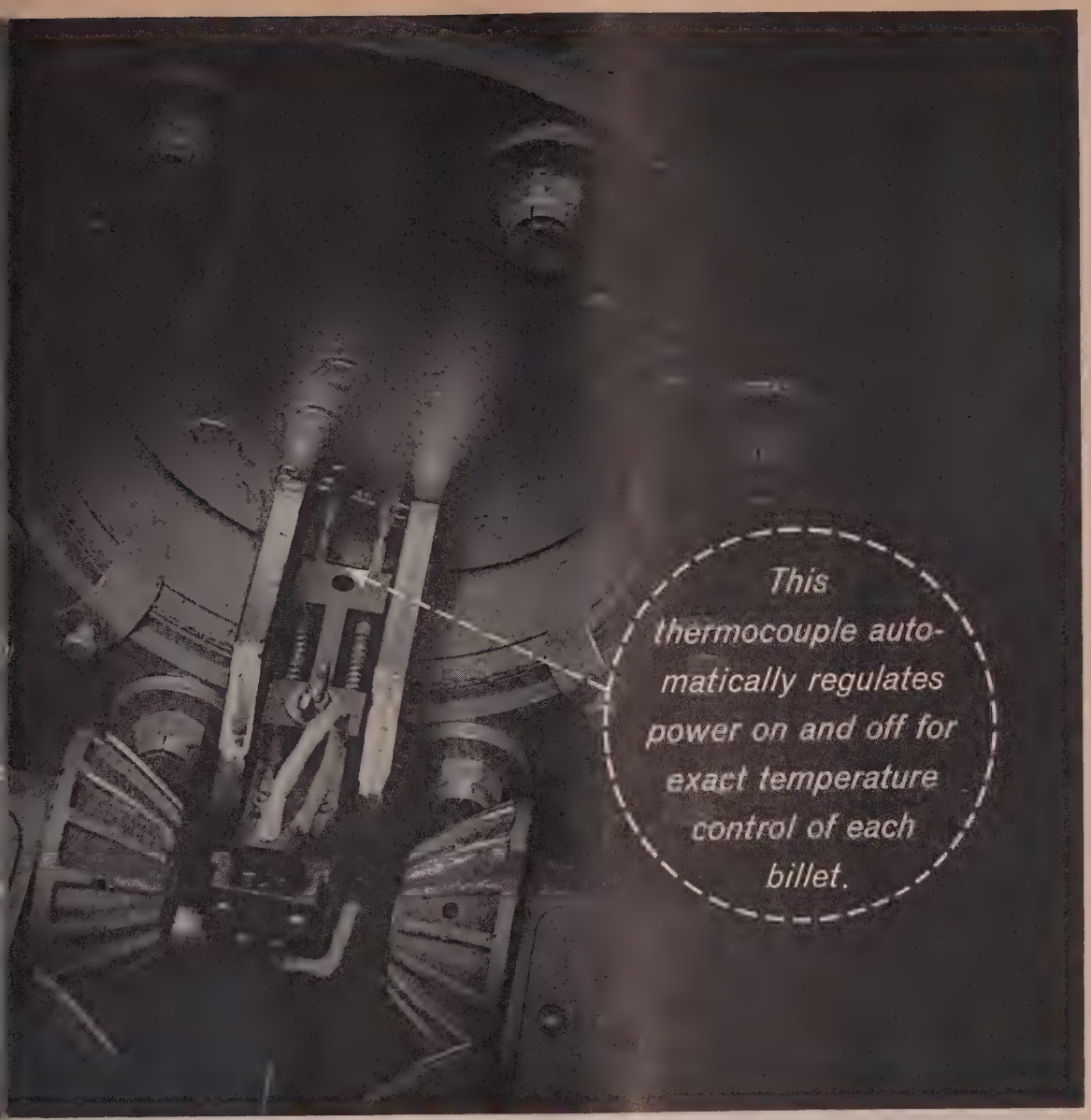

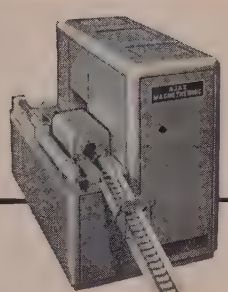

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Here and There

Who's Got the Market « « Latest round in game, "market, market, who's got the market," touched off last month when Olin Metals Divis released details of a survey indicating that alumin had 90% of the curtain wall framing business in 1 and would still command 87% of the volume by 1 The Olin study, which is summarized on pages 66 68 of this issue, also revealed that 20% of the cur wall panels installed last year were aluminum, that the metal's share would jump to 28% by To nobody's surprise, stainless steel producers qui challenged these findings. They don't think alumin will have anything like 87% of the curtain wall fra biz in 1963, and they don't like the Olin study's comparison showing aluminum panel costs subs tially below those of polished stainless steel. Mill fi stainless is recommended, they claimed, and in form it is cost competitive with aluminum. As fa we know, the steel boys haven't come out with estimate of stainless steel's share of the curtain business — either last year or in the future. But f what we gather, in examining some new projects the Chicago area, the real threat to both steel aluminum will come from precast concrete. S outstanding effects can be achieved with this mate and groups such as the Portland Cement Associa and the Prestressed Concrete Institute have launc hard-hitting campaigns to woo architects and build Maybe the time's coming when metal producers stop fighting among themselves and join forces ward off inroads by the non-metals.

Hot Problems « « The search goes on for a m that will withstand the heat of friction generate pushing space vehicles through the earth's atmosp Metals that qualify for 3000°F. heat resistance aren't good enough, space scientists point out, metals in the over-5000° class are mighty sc Rhenium, a hard metal that melts at 5400° F. i scarce it would take years to produce enough for space capsule. Tantalum, columbium, tungsten molybdenum are growing targets for the researc because they are more available and have exce heat resistance. A unique new plant operated for Navy by Universal Cyclops Steel Corp., Bridge Pa. is really a gigantic metalworking laboratory. the four metals are being forged and rolled in a vac at more than 400°F. Meanwhile, General Elec Missile and Space Vehicle Department in Philadel has developed pure crystals of aluminum oxide w when impregnated on aluminum metal, boost its resistance. GE estimates that the crystals render aluminum three times stronger at 2000°F. than strongest high-temperature alloys.

Window Maker's Woes « « By the end of year, Fenestra, Inc. will have closed its Oakland, C window plant. A steel window maker since the 1 this facility was converted to partial aluminum wi manufacture in 1958. It was wasted effort. "As a

Alkalume AC#1 is a safe, easy to use, non-silicated liquid used at low concentration with water. This latest addition to Northwest's outstanding line of specialized chemicals for use with today's modern metals offers these desirable features—

- Non-alkaline, non-etching, non-filming.
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window manufacurer, we were able to produce a quality product and make an adequate profit," said R. E. Sechler, Fenestra's vice president of marketing and former West Coast regional manager. "Because of the high capital investment required, there were a limited number of manufacturers in the field." But the market switch to aluminum scuttled the profit potential, Sechler claims. "With the appearance of hundreds of small companies making aluminum windows has come a wholly unrealistic pricing situation, making it impossible for a major producer to supply the market and still have an adequate return." In our June issue we published a letter from a well-heeled metalworking firm that was in the market for a company that had a good aluminum window product. The response was terrific, more than 40 letters from principals, brokers and lawyers, each with a window company to sell. Looks as though an awful lot of window companies are up for grabs. And if an outfit like Fenestra is ready to call it quits with its coast plant, the market must be sad indeed. Chalk up another victim of the unethical element within the extrusion industry.

Tough Titanium « « "Three years of service and no signs of corrosion." This is what Kuehue Chemical Co., Elizabeth, N. J., reports on its titanium heat exchanger and conveyor which handles the highly corrosive sodium hypochlorite at temperatures as high as 100°F. Solution enters the tubing hot but comes out at a temperature within 1 degree of cooling water in jackets enclosing the tubing (made of Republic Steel Corp.'s RS-55 grade titanium). Things are lookin for this erstwhile "wonder metal."

All-Plastic Autos — When? « « The adve such high strength plastics as Delrin and Celcon m the recent statement of American Motors' Robe Giles sound reasonable. He said that the auto ind is on the threshold of a "tremendous surge in utilization of plastic materials." The impact, he was being felt in functional as well as decorative a cations, and will eventually win engine applicat Ford Motor's John Mickey forecasts a total ave of 100 pounds of plastics per car by 1971, and said the all-plastic automobile is a distinct possibility. Henry C. Stuerzl, A. C. Spark Plug Div'n engi got down to cases in the plastics-in-autos question spelled out a tough assignment for plastics. A pl should have sufficient rigidity so it can be used supporting member; heat resistance to 250°F; re paintable with automotive lacquers; chemical resist to ordinary cleaners; satisfactory surface finish to mit metallized surfaces; dimensional stability; free from highly volatile matter to eliminate fog opaque without loss of desired properties; moldab a variety of colors; and a high rate of thermal ductivity. Then Stuerzl indicated that unless pla can be developed that are lighter in weight, pe greater latitude of design with better manufactu and assembly techniques or a reduction in cost, use in autos will be limited.

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Are you in need of an economical source of porcelain enameling of aluminum? We have complete facilities for prompt, economical, porcelain enameling of many sizes of aluminum panels and other relatively flat aluminum shapes that have been rolled, extruded, spun or cast. These include flat extruded panels, flat shapes for appliances, flat sheets and shapes for signs, and many types of aluminum extrusions for sundry purposes.

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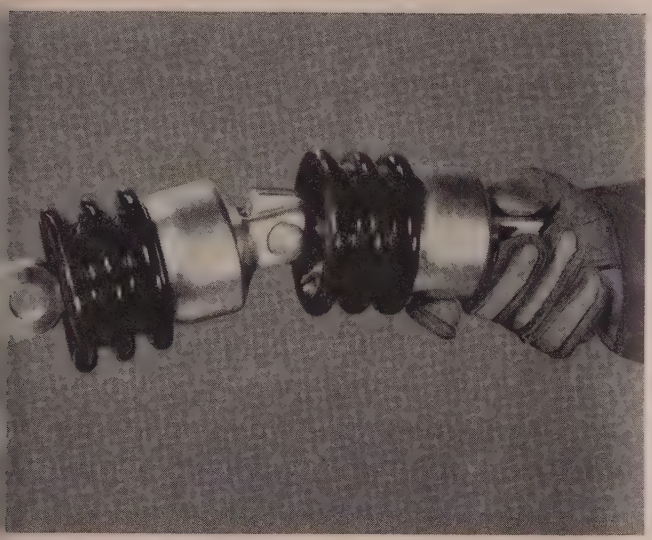
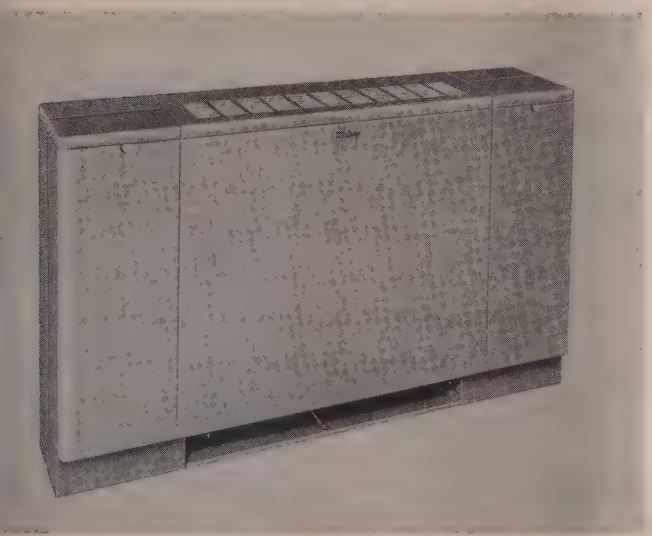


Hawaiian test shows aluminum will last "nui-loa" in new A. B. Chance insulators

Tests atop a power pole on the salty windward shore of Oahu recently proved the superiority of Kaiser Aluminum all-weather alloy 6061. This alloy—chosen by A. B. Chance Company for forged caps and studs of its high voltage insulators—will withstand exposure "nui-loa" (very long).

All galvanized pole hardware failed during this three-year test. Aluminum on the same pole remained bright, with free working threads and connections.

In addition to corrosion resistance, Kaiser Aluminum alloy 6061 makes the new Chance insulators lighter in weight, easier to install, and more efficient in protecting insulator ceramics against heat expansion damage. The manufacturer, A. B. Chance Company, of Centralia, Mo., is one of the largest makers of porcelain insulators.



Aluminum finned coils cool (or heat) air flowing from McQuay "Seasonmakers"

Highly conductive fins of aluminum transmit refreshing coolness or cozy warmth...the trademarks of McQuay, Inc., of Minneapolis.

Famous McQuay "Seasonmaker" remote type individual room air conditioners for use in all types of multi-room buildings use corrosion-resistant Kaiser Aluminum alloy 3003 as fin material to transfer heat or cold from tubes carrying liquid refrigerant. Light gauge aluminum sheet used as fins increases design efficiency in Air Conditioning Units that cool or heat, de-humidify and filter from 220 to 1240 cubic feet of air per minute.

Shown at left is the new "Thin-Line" McQuay Seasonmaker for individual room use – only 8½ inches thin and 25 inches high. According to the manufacturer, one setting of its control maintains "the season of your choice" in room or office.

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- when & how to use solid rivets
- how to design for riveted joints
- when tubular rivets are OK
- best tools for driving rivets
- when to use automatic riveters
- advantages of metal stitching
- its limitations, too
- machines & design for stitching
- types of standard aluminum threaded fasteners available
- how to determine tensile & shear strength of fasteners
- how to determine torque for aluminum fasteners
- how to make fastener holes in aluminum
- how to tap holes in aluminum
- types of powered screwdrivers
- how to specify & use special rivets, screws, bolts, locknuts, washers, studs, inserts, others

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8/61

Useful Data

The Cellulube Safety Series of fire-resistant hydrau fluids is detailed in a 36-page booklet which is desig to show how Cellulubes, products of Celanese Corp. America/Chemical Div'n, can make hydraulic facili operate more safely and efficiently. One section of t illustrated booklet outlines the benefits to be gai by using Cellulubes and gives examples of their ind trial application; the other section contains detai technical information on the properties of Cellulu and on procedures for changing them. Address advertising manager, 180 Madison Ave., New York for this booklet.

"Press Brake Dies and Their Forming Uses" all makes of press brakes, is a 134-page book publish by Dreis & Krump Mfg. Co., 7400 S. Loomis Blv Chicago 36, Ill. It is a comprehensive study of design and applications of the different bending a forming dies and punching units for press brakes. complete table of contents and section indexes ena quick reference to dies for any particular bendi forming and punching operation. This copiously ill trated manual costs $3.00; address Mr. Johnson for th

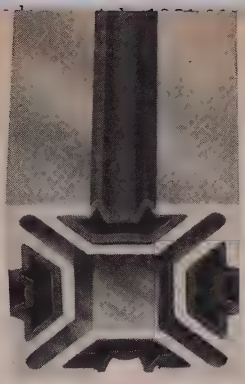
Die cast tooling facilities of The Efficient Tool Die Co., 9314 Elizabeth Ave., Cleveland 5, Ohio, listed in a special booklet brought out by the compa Lee Greenwald will send this on request.

Aluminum in architecture is the subject of a b chure produced by Aluminum Co. of America. T metal's advantages, specifications, finishes and all are discussed. Finishes include the range of Al Alumilite and Duranodic finishes, which are illustra with sample color panels. Address J. J. Maloney, Al Building, Pittsburgh 19, Pa., for this 8-page brochu

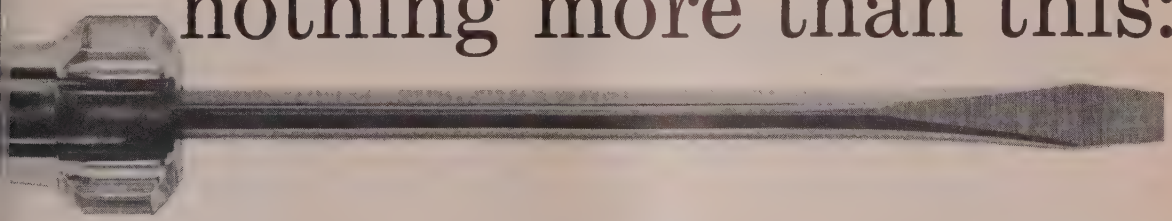
Coil handling equipment is described in a 4-p brochure and individual data sheets (all illustra showing such equipment as coil cars, downend transfer horns, uncoilers, coil tippers, etc. Full s are given for most of these items which are prod of Braner Engineering, Inc., 1316 W. Lake St., cago 7. Ask Harold R. Braner for this data.

Extrusion services and facilities in use at Gen Extrusions, Inc., Youngstown, Ohio, are described 16-page booklet. Photos show various department work; such post-extrusion operations as forming, w ing, mitering, punching, anodizing, painting, polis and buffing. Included also are descriptions of a range of anodized and chemical finishes. Address Schuler for this booklet at 4040 Lake Park Road.

Presses and shears made by Verson Allsteel Press 9300 S. Kenwood Ave., Chicago 19, are cataloged new brochure. The lines include straight side mecl cal presses, open back inclinable presses, hydr



Because of this extrusion, engineered with Olin Aluminum, 15 floors of the TIME-LIFE building in New York City can be quickly re-shaped with nothing more than this:



Olin engineers helped design this unique extrusion to serve as the universal junction of movable wall panels. The genius of this extrusion makes it possible to change office size, shape and color in jig time with nothing more than a screwdriver! So many Olin ideas like this have saved so much time and money for fabricators, designers and architects that modesty forbids telling all. As versatile as aluminum is, it doesn't think, doesn't create designs, or doesn't fabricate itself. That's why Olin Aluminum offers you the services of its marketing and technical staff. They "think aluminum." Don't you think it would be a good idea to call Olin?

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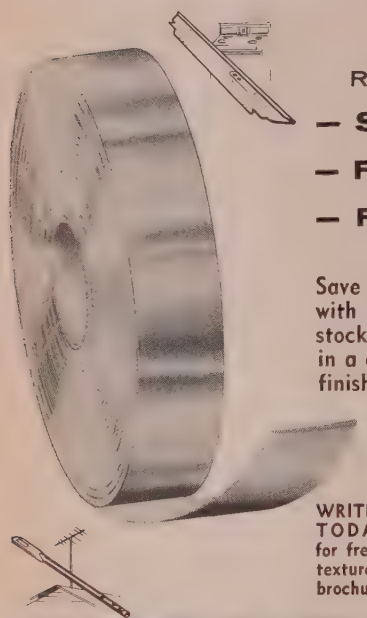

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Save double handling with aluminum coil stock *PRE* anodized in a choice of finishes and colors.

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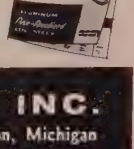

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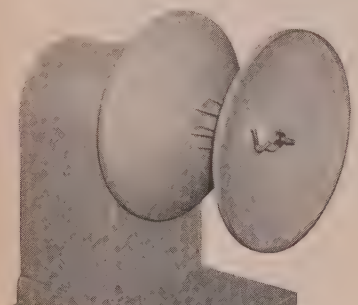

- Electrically operated.
- 36" high, 32" long, 24" deep.
- Weight of unit 400 lbs.
- Cost $450.00 F. O. B. Factory, Chicago, Ill.
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Specialists in coil handling and processing equipment.

presses, shears and press brakes and mechanical pre brakes; also, special purpose presses and equipmen transmat presses, impact machines and press brak tooling. Ask Ronald Dahlberg for catalog 6-60.

Spray cleaning products are described in a 6-pag brochure produced by the J. B. Ford Div'n of Wyan dotte Chemicals Corp. Covered are one-operation clean ing and phosphating, simultaneous cleaning and rus proofing, heavy-duty cleaning without foaming, an aluminum cleaning without etching. Under "Selectin the Right Spray Cleaner" is a detailed enumeration o the principal factors to be considered in setting u spray cleaning operations. Write to Robert Raine a Wyandotte, Mich. for this booklet.

Screwdriving tools in the two basic types, two-piec tools (including bit holders, service drive bit holder and hand brace bit holders, to fit on the power o manual driver) and one-piece tools (the bit or drivin point is integral with the tool) are cataloged in bookle 30-C of the Apex Machine & Tool Co., 1025 So. Pa terson Blvd., Dayton 2, Ohio. Write to Tom Polle for this 54-page catalog.

"Coreless Line-Frequency Crucible Induction Fu naces" is the title of a 14-page technical treatise on th relatively new induction heating principle, publishe by Brown Boveri Corp., 19 Rector St., New York Write to Tom Lucier for this booklet.

Electric or gas-fired continuous draw furnaces ar described in a new 6-page brochure prepared by Sur beam Equipment Corp., 180 Mercer St., Meadville Pa. The range of application of these units are give and their advantages noted. Complete specs are give and various sizes of draw furnace are pictured. A draw ing of a typical gas fired furnace is shown, accompanie by specs. Write to Dick Stephenson for this folder.

"Titanium for Missiles" is a 14-page study prepare by Titanium Corp. of America, 233 Broadway, Ne York 7. Six major application areas for titanium i missile construction are summarized in this booklet. shows in full color the nation's entire arsenal of missil and space vehicles now under design or constructio and includes brief discussions of the four titaniu alloys of greatest significance to the missile builde Case studies show pertinent cost data. Ray Waterkot will send this from Timet.

"The Chemical Preparation of Aluminum for Resi ance Welding" is a new publication of Oakite Produc Inc., 50A Rector St., New York 6. Among the maj topics discussed are cleaning in preparation for o oxidizing, cold and hot deoxidizing and etch-cleani to obtain a mat finish. The booklet also probes in the variables involved in resistance welding and poi out that "more important than resistance limits uniformity of resistance." Four specific weld prepa tion procedures are also outlined. Write to Edwa Carlson for this booklet.

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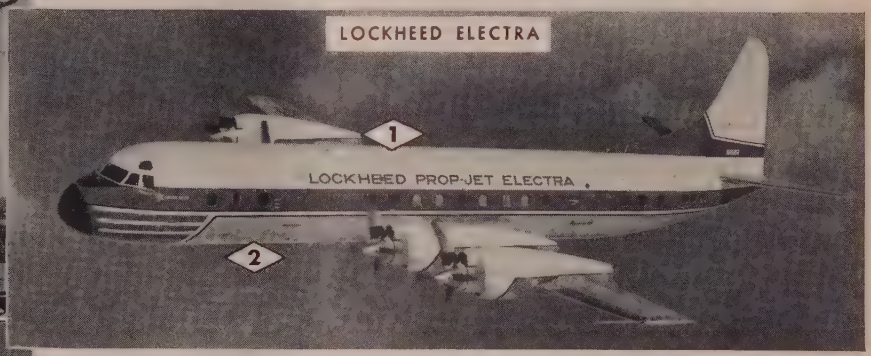

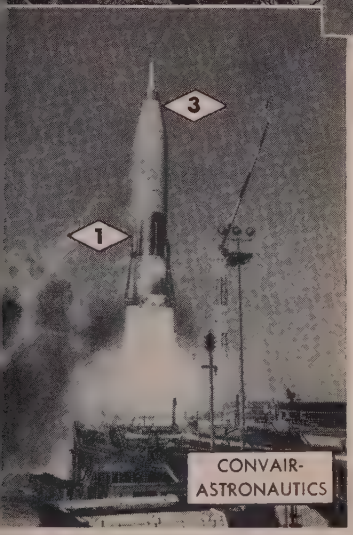

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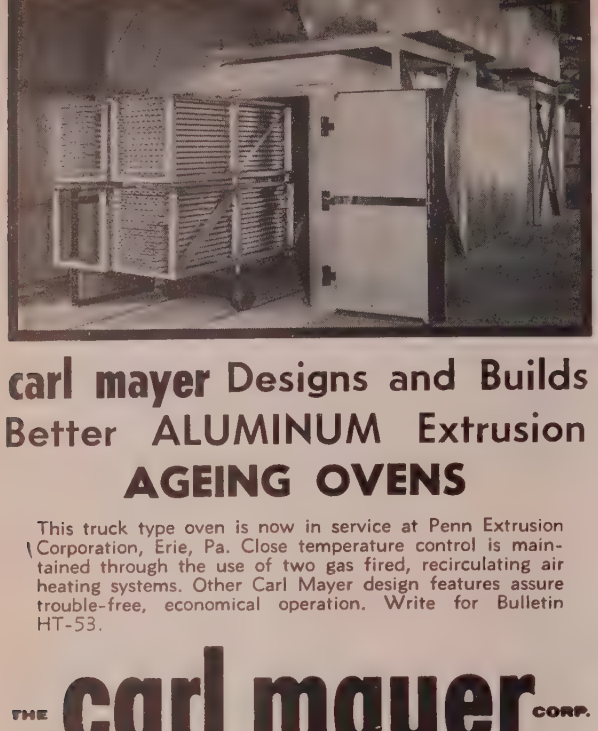

carl mayer Designs and Builds Better ALUMINUM Extrusion **AGEING OVENS**

This truck type oven is now in service at Penn Extrusion Corporation, Erie, Pa. Close temperature control is maintained through the use of two gas fired, recirculating air heating systems. Other Carl Mayer design features assure trouble-free, economical operation. Write for Bulletin HT-53.

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Cuts nonferrous metals without burr and at a high rate of production

For aluminum extrusions, billets, copper and brass bars, tubing, etc. Designed for precision performance.

Saw: 14" std. for 3" cuts; 20" max. for 6" cuts. Stroke: 28 per minute maximum for 6" wide material. Table is cast iron 15" x 48" with aluminum throat plate and opening with chute for automatic removal of pieces up to 6" long.

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OLIVER

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GRAND RAPIDS 2, MICHIGAN

New Enterprise

A/S Norsk Aluminium Co., Norway, is expandi its aluminum **smelting facilities** at Hoyanger fro 13,500-ton annual capacity to 26,000 tons. Also, co struction has begun on the expansion of the company fabricating and manufacturing subsidiary at Holm strand.

The **aluminum-glass sliding door** manufacturer, Ful view Corp., Glendale, Calif., has been purchased b Cal-Tech Systems, Inc., San Jose, Calif.

Loral Electronics Corp., New York, has entered th **beryllium** fabrication field with the purchase of Amer can Beryllium Corp. and its two subsidiaries, Visio eering Co. and U. S. Beryllium Corp. Loral obtaine the firms in exchange for 95,840 Loral shares.

The shutdown of the John Lees **aluminum and stai less steel moulding** plant in Muncie, Ind., has bee announced by Cullman Products Corp. The produc are now being produced in the firm's Cullman, Al plant.

Aluminum siding, previously used only on perm nent dwellings, has made its debut as **mobile hon** cladding. New Moon Homes, Inc., Alma, Mich., is usi 12-inch vertical siding on 50 introductory "Patricia units.

A collapsible **two-wheel hand truck** made of alu num has been developed by Sturgis Mfg. Co., Haxtu Colo. The truck is called Tota-Ton; weighs less than pounds but is capable of lifting 500 pounds. It is ma of 6062-T6 aluminum extrusions.

Aluminum doors cut costs and reduced weight of t *Kitty Hawk*, first Navy aircraft carrier to be equipp with surface-to-air missiles. The 864 doors needed we fabricated by Superior Steel Door & Trim Co., 15 126 St., College Point, N. Y. The doors weigh pounds less than steel ones would; saved approximat $22,000. Half doors were pressed from 5052 alumin sheet, welded, the weld ground and painted.

A group of Japanese firms have formed a compa which will produce aluminum. Heading the group is Yawata Iron & Steel Co. which has developed a meth of extracting aluminum from **laterite ore** after ferr material has been removed. Laterite is an ore found abundance in the Philippines and other Southe Asian countries. Nissó Steel Mfg. Co. and Konos Sansho Trading Co. are working with Yawata.

New products along with company expansions, quisitions, etc., indicate an increased vigor in li metals plants. Products are taking many forms shapes, for example: Zero Mfg. Co., 1121 Chestnut

(Continued on pag

GET A CLEANER

BRIGHTER

STAIN-FREE SURFACE ON YOUR COLD ROLLED ALUMINUM SHEET & FOIL

Simple test and light meters indicate that the Aluminum Stain Test Plate on the right, coated with KS-485, has no stain and is twice as bright as the disc on the left, which was coated with a commonly used product.

with KERNS NEW KS-485 ALUMINUM ROLLING OIL

Kerns United . . . pioneers in the research and development of all types of rolling oils . . . have formulated this aluminum cold rolling oil that is superior in many ways, particularly in its ability to produce clean, stain-free finishes. "Kleen Strip" 485, the greatest advancement in aluminum cold rolling oil, is designed specifically for mills that want to produce the cleanest possible strip, at the same time obtaining tonnages and reductions unattainable with any other product. Customers rate you as a supplier according to the appearance and surface condition of your product. Let KS-485 put you at the top of their list.

CHECK THESE OUTSTANDING POINTS

Cleaner strip off the mill, and through the anneal, Greater prime yield, Extreme stability resulting in negligible loss through filtration systems, Increased tonnage, Easier and greater reductions, Lower mill loads, Lower cost per ton, Better shape

One concentrated product, complete in itself, which you dilute in your tanks with low cost, readily available diluent

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We will supply a sufficient quantity of KS-485 for a production test run on your mill on the basis of proven performance or no cost to you

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As a major part of an extensive expansion program at its Terre Haute, Indiana plant, Anaconda Aluminum Co. has installed this PITTSBURGH 66-inch four-high cold rolling Breakdown Mill. This equipment produces aluminum strip with a minimum thickness of .012″ up to 60″ wide at a speed of 1,200 feet per minute to help meet the increasing volume of orders specifying exacting gauge tolerances and surface quality. The mill also produces foil stock for Anaconda Aluminum's Foil Division at Louisville, Kentucky.

Important design features of this PITTSBURGH mill include hydraulic roll crown control, special reel drives to provide added flexibility and strip gauging equipment for automatic gauge control.

For all your requirements in rolling mill equipment and related facilities, contact PITTSBURGH.

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Pittsburgh Steel Foundry Co., Textron Inc.

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Burbank, Calif, is deep drawing aluminum **instrument housings** designed to withstand internal or external pressures of 15 psi. Each half of the housing, drawn from .063-inch 6061-T6 alloy, has extruded male and female grooves spot welded in place and epoxy sealed so the parts can be quickly locked together.

A new line of aluminum **gutters and downspouts** for the home is being distributed by Navaco Co., 601 Hall St., Dallas 26, Tex. The box-type gutter has a white baked enamel finish and a slip joint construction which enables assembly without soldering or corner mitering.

Removable **mullions** which allow industrial or commercial buildings to have wide, clear span openings for truck entering, etc., are being extruded from aluminum by Crawford Door Co., 20263 Hoover, Detroit.

A **flat-bed trailer** with an all-aluminum frame and tri-axle construction is being built by Ravens-Metal Products Inc., 1300 Market St., Parkersburg, W. Va., for hauling heavy machinery, timber, structural steel, etc. The 35-foot long frame has 20-inch deep I-beam stringers, 5 by ¾-inch flanges and ¼-inch web plates, 8-inch structural channel side framing, 6-inch channel cross members and 1½-inch laminated oak flooring.

A finer, more insect-proof residential aluminum **screening** has been developed claims Dodge Wire Corp., Covington, Ga. New screening has 18 by 16 strands per square inch, as opposed to the conventional 18 by 14, and uses .011 inch diameter wire instead of .013 inch.

Front office manuevers include: The expansion of **siding** manufacturing and distributing facilities at a cost of $500,000 at the Barberton, Ohio, plant of Weather-Seal Inc. In an effort to double siding production the firm is building a 31,000 square foot addition which will house an extrusion press, treating and conveying equipment, 18-stage roll former and automated packaging equipment.

Ground has already been broken for a new automated nonferrous **smelter** and scrap handling facility by Northwestern Metal Co., Lincoln, Neb. The 67,000 square foot plant will be equipped with gas-fired reverberatory aluminum, brass and white metal melting and holding furnaces, conveyorized ingot moulding machines and handling equipment and will house offices, a laboratory and an ingot warehouse.

Kaiser Aluminum and Chemical Corp., Oakland 12, Calif., and a group of investors in Venezuela have organized a new company, Aluminio Nacional S. A. to establish the first aluminum **foil** production facilities in the country. A plant will be built at Guacara and will begin operations late this year. Kaiser holds 26% interest and will supply aluminum sheet and technical assistance required for plant operation. Jacques Alexandre of Venezuela is president of the firm.

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PRODUCT BY

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ALUMINUM COMPANY OF AMERICA

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AMCHEM ALODINE*

This gleaming hangar facility of Scandinavian Airlines System at N.Y. International Airport features a tough, baked enamel Alumalure finish over strong, lightweight aluminum—Alodine treated for additional corrosion resistance and paint longevity.

How Amchem Pre-Paint Treatment, NSE Processing Help Put the "Lure" in Alcoa Alumalure!**

Alcoa Alumalure baked enamel finish on industrial roofing and siding sheet has made a startling impact in building circles. A low cost, decorative, maintenance-free exterior wall surface, available in 11 colors, it is widely used for new buildings as well as remodeling older structures.

Key to Alumalure success—strong, light aluminum and design innovations by Alcoa . . . precision finishing by NSE Signs & Stampings . . . unmatched protection and paint adhesion by Amchem Alodine chemicals.

With color matching standards a prime-requisite, assurance of paint adhesion on Alumalure sheets is a vital necessity to protect customers who buy the product, months later reorder and expect exact color match. Results to date on millions of square feet of Alumalure processed—no paint failure or rejects involving chemical treatment by Alodine!

Rigid quality control has resulted in a fine production record for Alumalure at NSE's Birmingham plant.

Full time NSE and Alcoa inspectors watchdog every foot of sheet throughout the production cycle. For chemical pre-treatment Alcoa specifies high standards of Government Specification MIL-C-5541. NSE selected and uses Alodine for "the best metal preparation treatment you can find." NSE management states emphatically, "There's no question about what Alodine has done for the preparation of aluminum for painting. We don't have paint failures. We don't have customer rejects."

An "extra" plus from Alodine—Alcoa finds additional customer appeal in the gold coat Alodine creates on Alumalure backing which provides a pleasing antique decorative finish for building interiors.

If you want—corrosion resistance, lasting paint adhesion, rejects slashed to the vanishing point and sales ammunition that helps sell products—investigate Alodine, the industry's first and today's standard conversion coating chemical for aluminum!

* Amchem's trademark for its conversion chemical coating for aluminum.
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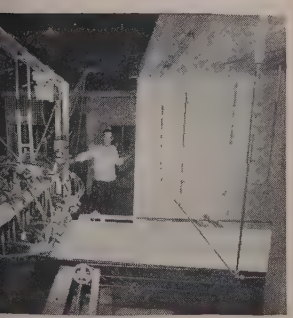
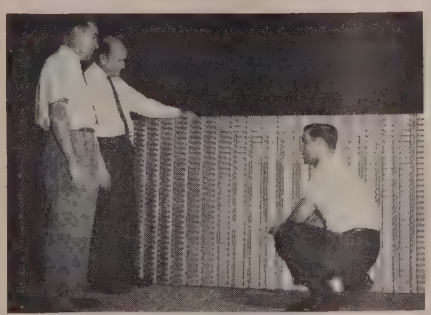


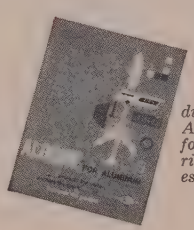
After treatment with Alodine, a ribbed siding sheet is painted employing Ransburg electrostatic paint equipment. NSE can run two sheets in tandem, accomplishing 60-lineal feet per minute painting.



NSE Executive Vice-President John Montgomery (left), Plant Manager R. Cater Lee, and Alcoa (quality standards) specialist J. Shea (right), inspect "3D" Alumalure sheet.

The massive equipment shown here is an ultra-modern, newly installed Lanly oven for handling Alumalure sheets.

AMCHEM **ALODINE**



Write for free bulletin 1424C, outlining the uses and many different types of Alodine available for aluminum fabricators and processors.

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HOME BUILDING BUSINESS LURES TWO SIDING FIRMS

Alside, Inc. unveils mode
prefab; is building a plant f
its manufacture. Another s
ing firm, U. S. Aluminu
Siding, is blueprinting its p
fab model. Both will ma
extensive use of aluminu

by H. K. Darby, Associate Editor

PLANS to enter the prefabricated house business were announced early this month by one aluminum siding manufacturer, while another siding firm revealed that it may eventually bring out a prefab of its own.

At a press preview, held August 1 at its Akron, Ohio plant, Alside, Inc. unveiled the prototype of its ultra-modern aluminum and glass prefabricated home. Alside president Jerome J. Kaufman also announced that the company had already begun construction of a 300,000-square foot plant to manufacture the curtain wall-type home.

Close to $5.5 million will be invested in the new facility, Kaufman added, and the production rate is slated for 200 homes a day. The plant is scheduled to begin operations in the fall of 1962.

Emil A. Tessin, II, vice president of Alside Homes Corp., wholly owned subsidiary of Alside, Inc., said the homes will be manufactured with more aluminum than any other previous dwelling. The light metal will be used for exterior and interior walls (but not for interior partitioning), roofs, ceilings, doors and many other applications, he said.

All exterior panels have a standard height of 8 feet. Panel widths vary, depending on their location. They are composed of .032-inch thick aluminum sheet on both sides, separated by four inches of expanded styrene.

The house pictured uses panels measuring 8 x 12 feet and 8 x 14 feet. They have baked enamel exterior finish, some colored red, some yellow. According to Tessin, they are the biggest one-piece sheets ever finished with baked-on enamel. The structurals are steel, and it seems to be the plan of the manufacturer to stay with steel for the framework. A sun shield, not shown in the picture, will be an aluminum pan over the steel structure.

"Major activity centers of the home have immediate access to spacious outdoor patio areas through several sliding glass doors, while superior insulation material, insulating glass, and central heating-air conditioning provide ultimate comfort within the home," an Alside Homes spokesman said.

"Exterior wall units of glass and aluminum are complemented by spacious interior rooms and a fully equipped kitchen, including counter-top range, dual built-in oven, refrigerator, freezer, dishwasher, disposal and food blender."

Instead of dry or plaster wall partitioning, divisions of space are effected by "packages" of unitized functional dividers such as closets, kitchen counters, etc. Shelving, trim and doors of these units will be aluminum.

"When in mass production, each home will have a total weight of about 3100 pounds of aluminum," said Tessin, designer of the Alside home. He also pointed out that kitchen equipment, air conditioning, insulating glass and superior wall, roof and floor insulation material will be included in the basic purchase price.

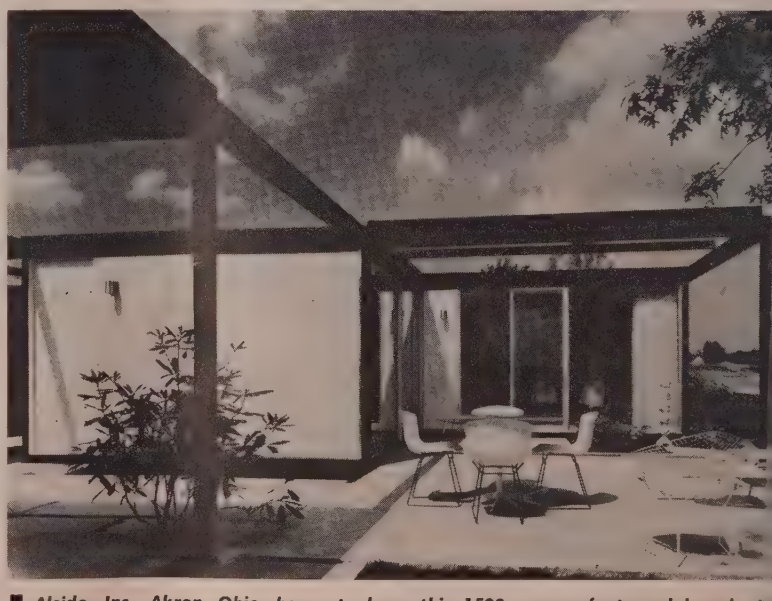
The prototype has living room, dining room, kitchen, family room, three bedrooms, two complete baths and a two-car carport. The 1500 square-foot model is designed to sell, completely erected, for about $12,000, without lot.

Alside's aluminum home makes its debut as housing authorities are predicting a period of substantial gro
ahead for the industry. Governm
agencies and independent resea
groups agree that the "war babies
children born during World War
representing an unusually large pop
tion increment — will be reaching ad
hood and starting to raise families
their own in the next few years.

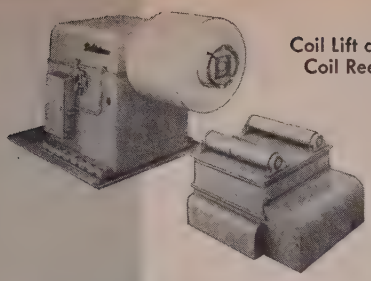
It is estimated that the number
Americans in the 20-to-30 age group,
young married couples who do most
the nation's home buying, will reach
million this year and swell to about
million by 1970. This is expected
start unprecedented housing expansi

As great as it is expected to be, h
ever, the rate of expansion in hous
will be exceeded by the growth rate
the prefab segment of the home bu
ing industry, most observers ag
Whereas 10 years ago prefabs accoun
for only 5% of the new home constr
tion, they have about 15% of the to
today. Up to 350,000 prefabs might
bought in 1965, perhaps as many
800,000 by 1975.

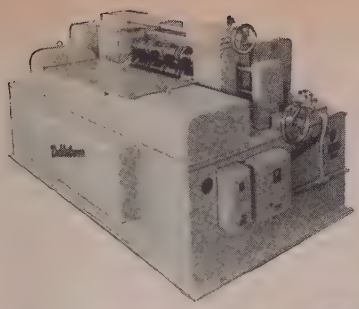
Merrill Lynch, Pierce, Fenner & Sm
observed: "Some housing men pred



■ *Alside, Inc., Akron, Ohio, hopes to have this 1500 square foot model and ot
of its type in production late next year.*

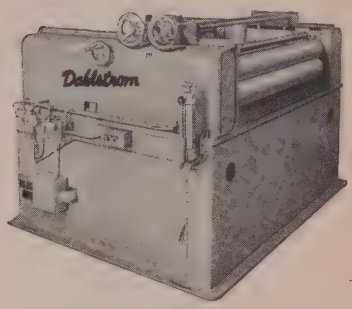


Coil Lift and Coil Reel



Combination Dual Head Edge Trimmer and Scrap Chopper

Roll Straightening Unit



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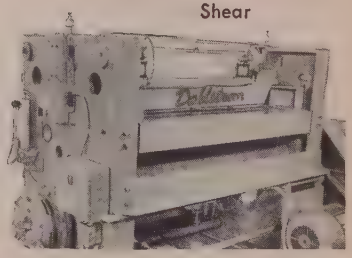
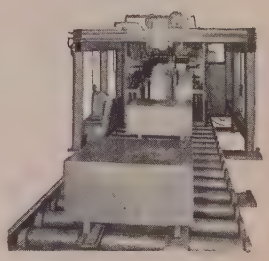
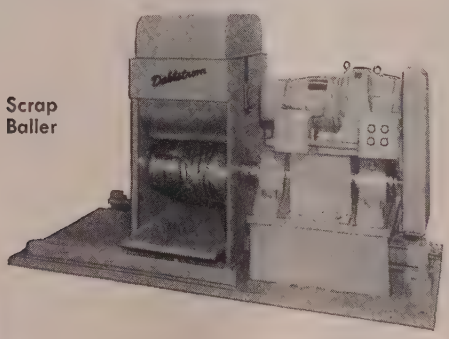
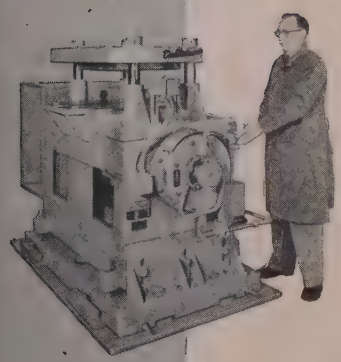


Automatic Stacking Unit



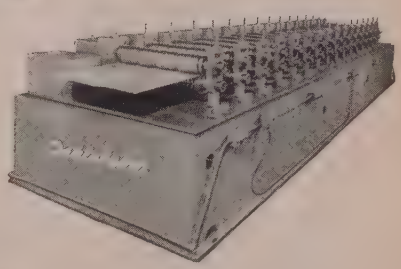
Scrap Baller





Sliding Die Type Cut-Off Press

Roll Forming Machine



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■ *U. S. Aluminum Siding Co., Franklin Park, Ill., is moving toward production of this home which will use conventional siding, and aluminum extrusions for studs, beams.*

by 1970 one out of every four homes will be prefabricated and by 1975 factory-made homes could take as much as 40% of the housing market."

There are some sound reasons why prefabs are expected to achieve this growth. Prefabrication has sharply reduced construction labor rates—up 56% in the past decade, according to F. W. Dodge Corp., construction news service. The *Wall Street Journal* points out that builders are turning to prefabrication in the belief that "components can be mass produced in factories far more cheaply than they could be assembled on-site by high-priced building trade workers."

New Babies, New Rooms

Another big reason for prefabs' growing appeal is their flexibility. The prefab owner can alter or add to his existing home as his family grows.

In the light of the bullish outlook for prefab home sales, it is natural to expect that other aluminum firms will plan to enter the field. It seems reasonable to expect that some of these firms will be siding manufacturers, like Alside.

An oddity of the trend from siding manufacture to prefab production is that neither Alside nor the newest possible entry has taken steps toward backward integration, while at least three other siding firms that are highly integrated have not indicated any immediate interest in the prefab market.

U. S. Aluminum Siding Corp., one of the largest aluminum residential siding firms, has re-entered the ranks of the manufacturers in this business, and has its sights raised to eventual backward integration of its operations to production of its own coiled aluminum sheet, and forward integration toward the manufacture of prefabricated aluminum homes.

Last year, U. S. Aluminum's sales volume involved the conversion of some 12 million pounds of aluminum coil into siding. This, says the Aluminum Siding Manufacturers Association, makes U. S. Aluminum the fourth largest company in the business.

"Last year we did more than one-quarter of the volume of the industry's biggest producer, with only one thirty-fourth of that company's capitalization," said Henry J. Nassan, chairman of U. S. Aluminum Siding. [Alside, Inc., Akron, Ohio, reportedly the industry leader, grossed about $23 million in 1960, the company's statement shows.]

This year, Nassan expects the company to sell well over $10 million worth of siding and other aluminum home building products.

Since mid-April the firm has been producing seven aluminum siding products at its new plant at 11440 W. Addison St., Franklin Park, Ill. At the formal opening of this 66,000 square foot facility late last month, Nassan revealed his intention to eventually install melting and continuous sheet casting equipment.

Presently, the firm buys bare coil in finished thicknesses which is then coated with the firm's own thermosetting acrylic formula. Reynolds Metals and Kaiser Aluminum supply the metal.

If and when U. S. Aluminum *does* produce its own sheet, it will be the third among the larger siding manufacturers to use the continuous casting process. The first, Consolidated General Products, Inc., Houston, Tex., uses two Hunter sheet casting machines to produce sheet for a fairly wide range of aluminum building products.

More Sheet Casters

Security Aluminum Co., Detroit, Mich., is now installing a Hunter Machine. One other siding producer, Alsco, Inc., Akron, Ohio, produces required sheet thicknesses via the hot breakdown of rolling slab.

If the Franklin Park firm *does* become integrated to this extent within the next few years, it will have reached full development at an early age. It was in 1949 that Nassan, a specialty salesman all his working life, formed U. S. Metals Co. for the manufacture of siding and other aluminum building products. It was a natural evolutionary step after seven years of making and selling steel tile and soft siding products through his firm, Atlas Construction Co., Chicago.

Aluminum siding had appeared on the market in 1947. The next year, Nassan secured for Atlas sole distributorship of an aluminum siding product in Illinois and Wisconsin. The fact that he was able to move more than a truckload of siding a week convinced him of the product's profitability. That's when U. S. Metals Co. was born.

"Business increased steadily as we sold more dealers on the merits of aluminum siding," Nassan recalled. "What helped our customers were the sales aids we provided, ideas which had originally been developed for Atlas Construction Co."

In December, 1952, Nassan changed his company's name to The U. S. Aluminum Siding Corp. The company built a plant in Franklin Park in 1956, but never put it to work as a manufacturing facility. Instead, the company's entire manufacturing was turned over to a Wisconsin-based subsidiary of American Marietta Corp.

The building was used as a warehouse and distribution point for the finished products developed by U. S. Aluminum—products such as "Koverlum" and "Everlum" siding, shutters, downspouts, painted guttering and stone siding.

The Key: Strong Sales Force

Subsequently, Nassan was able to concentrate on development of a strong national sales force which has been a prime factor in the firm's rapid growth. They now have more than 15,000 dealers, he said.

"A strong sales force and the development of imaginative sales techniques are among the prime reasons for our rapid expansion," Nassan said. "For instance, complete advertising mats, sales brochures and display materials automatically go out with every order shipped."

U. S. Aluminum Siding is now blueprinting the techniques for making and marketing the company's line of "New Frontier" homes. The all-aluminum prefabs will retail for around $7500, Nassan said. Models of the homes will be unveiled soon, he added.

For this program, as well as for the development and manufacture of other building products made of aluminum, Nassan expects that the company's four acres will have to be improved at an early date.

"Our present new plant is the first phase in a long-range building and expansion program which ultimately will give us a total of 130,000 square feet," Nassan said.

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SPECIAL REFRACTORIES FOR ALUMINUM

Critical properties, characteristics, present and potential applications of silicon carbides, aluminas, mullite, zircon, bubble and fibrous ceramics are detailed by a refractories expert.

by W. L. Peskin, Assistant Manager

Technical Branch, Refractories Division, The Carborundum Co., Perth Amboy, N. J.

THE aluminum industry appears to be in a stage of development similar to that of the glass industry just a few years ago. The deficiencies of existing refractories have been known for some time. But following considerable work, several potentially excellent products have emerged.

The cost of some of these new materials is high by present standards, and both plant and laboratory evaluations are being made to see if they fit into the economy.

These special refractories include silicon carbide, fused alumina, electric furnace mullite, zircon, alumina bubbles, and fibrous ceramics made from alumina-silica fusions.

Silicon carbide grain, first used as an abrasive, has long been exploited as a refractory. Its properties are high hot strength, high thermal conductivity and thermal shock and abrasion resistance. The main shortcoming was that it oxidized and had disappointing life. Successful development finally led to oxidation-resistant products that gave economical service.

This was principally dependent upon development of suitable bonding agents. Since no single bond could meet all conditions, several varieties were developed, each aimed at a specific set of industrial conditions. These materials are outgrowths of the original clay-bonded ware, and are ceramic.

The bonds are essentially siliceous, and either glassy or a mixture of glass and crystalline material. Included is a bond developed primarily to resist penetration and attack by molten aluminum.

Continued research for improved properties led to development of silicon nitride bonds (Patent No. 2752258, June, 1956). These bonds have greater stability against oxidation and flame erosion, increase strength and better resist molten aluminum. These commercial materials are now used in a wide variety of applications and are being investigated for many more.

A third type of bond, still in pilot plant stages, is the self-bonded or recrystallized type which approaches the properties of the single crystal.

Fused alumina. In many instances aluminum oxide is advantageous because of its chemical inertness. Temperatures as high as 3092°F frequently are required to develop stability and maximum properties of the refractories. One way of attaining the desired properties is to melt the alumina in an arc furnace; cool and crush the resultant "pig"; and re-bond the grain into refractory shapes.

The bond may be ceramic as in silicon carbide, hydraulic-setting calcium aluminate, or phosphoric acid or its derivatives.

Mullite is a compound ($3Al_2O_3$-$2SiO_2$) with characteristic needle-like crystals that can be made into refractories having excellent load-bearing and thermal-shock properties at up to 3200°F. Crystals can be developed by high-temperature firing of mixtures of alumina-silica minerals having the requisite proportion of the two oxides.

Within the limits of ceramic kiln temperatures, the conversion to mullite is slow and often incomplete. By fusing the materials first, full crystalline development can be attained. As in the case of fused alumina, the crystalline material is crushed and bonded into shapes. The kiln firing need only develop the bond.

Zircon occurs in nature as a sand whose coarsest size is 60 to 80 mesh. Refractories are made by carefully combining particles of washed and ground raw material, then forming and firing ceramic methods. The refractories resist corrosion by aluminum, glass and certain slags.

Bubble and fibrous ceramics. Experiments with techniques of fusing alumina and alumina-silica mixtures have led to several interesting developments. By blowing the molten-oxide stream with a high-velocity jet of air or steam, either hollow spheres or fibrous material can be produced.

Bubbles can be made in the composition range at or near 100% alumina. Products made from these bubbles can be formed with either fired-ceramic or chemical bonds to provide insulating refractories for service above 3000°F.

With a composition of about half Al_2O_3 and half SiO_2, blowing produces a non-crystalline fiber with exceptional insulating value. It is available as paper, blanket, board, block shapes, and a variety of textile forms. These products retain their properties up to 2300°F at which point the fiber begins to crystallize.

Refractory properties of general interest include hot and cold strength, ability to bear loads at elevated temperatures, thermal conductivity, thermal expansion, resistance to thermal shock, density, porosity and permeability to air. Considerable data are available on these properties and many test methods have been standardized by ASTM.

Most data and tests, however, are aimed at verifying performance in the high-temperature ranges encountered in the steel and glass industries. Since alumina melts at a much lower temperature, many of these measurements are of secondary interest. Basic data such as thermal expansion are vital for engineering design, but are not part of the parameter that determines the suitability of the material for use in the aluminum industry.

The primary property is resistance to attack by molten aluminum and/or cryolite. Also of importance are thermal conductivity, resistance to abrasion, and mechanical strength. In this study, these properties are reported for a range of standard and developmental materials. Tests different from standard practice or unique to this study, are described.

Modulus of Rupture test is performed in a conventional cross-breaking machine. A similar test is performed in a furnace at 2462° F.

Load Test involves a furnace in which 4½ x 2½ x 2¼-inch piece of brick may be loaded vertically on the 2½ x 2¼-inch face with loads of 25 to 50 psi. They are heated to 2732°F and held for 50 or 100 hrs.

The furnace has four loading ram

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so that check samples can be run simultaneously. Measurements before and after test are calculated as percent deformation. Data reported herein are for non-silicon carbides, held at 25 psi for 50 hrs. Silicon carbides show almost no deformation at 50 psi for 100 hrs.

This is a more severe test than the standard ASTM method, which calls for a 25 psi load over a heating schedule which holds for only 90 minutes at peak temperature. It has been found inadequate to discriminate between these materials.

Abrasion Resistance is a difficult property to measure, since conventional dimensions fail to describe it. Accordingly, we established a comparative test that is reproducible and useful for product ratings. Test apparatus includes a turntable 20 inches in diameter, on which ten brick-size samples are positioned radially on end with rubber-covered wooden-wedges as spacers.

The ring thus formed is clamped with steel straps. Included in each test is a standard silicon carbide brick of a type long used to withstand wear.

The assembly is placed in a sand-blast booth, and a new standard ¼-inch diameter nozzle is positioned 4 inches away from the surface of the brick and set to impinge at a 90° angle. Blastite® #30 grain (fused alumina) is fed at an air pressure of 80 psi. The turntable is rotated at 12 rpm for 200 revolutions. The brick are weighed before and after test.

Based on density measurements, the material removed is calculated as volume loss. The standard silicon carbide brick is assigned a value of 1, and an index is calculated for each specimen as a multiple of the standard. After each blast, the brick can be rotated and/or turned over and run again so that four measurements can be made on each sample. In a normal test, approximately 50 to 60 gms. are removed from the silicon carbide standard.

Aluminum Penetration. After investigating many methods, we adapted an apparatus used for many years to measure the corrosion of refractories by molten glass. It consists of a rectangular furnace measuring approximately 23 x 33 x 11 inches. Inside dimensions are 23 x 13½ x 6-inches deep. A drain hole is provided in the center of the bottom.

Samples are arranged around the inner walls to form a chamber approximately 6½ x 15½ x 3½-inches deep. A silicon nitride-bonded silicon carbide tile, 1-inch thick, with a central hole is placed in the bottom. The hole is filled with alumina or zircon grain.

Up to six whole bricks resting on their 9 x 2½-inch faces can be tested at one time. As many as twenty smaller pieces can be run simultaneously. Test pieces are so arranged that faces exposed to metal are the same as those exposed in normal service. All joints are sealed with zircon cement. Any space between test pieces and the inner furnace wall is filled with loose alumina bubbles.

The heat source is eight Globar® heating elements in the removable top, connected into two series circuits of four each and run from a 15 KVA transformer controlled by a recording potentiometer.

Aluminum is put into the furnace cold, brought up to test temperature, and held for the desired time. Approximately 25 lbs of metal are used, which brings the metal line to within ½ to 1-inch from the top. The test may be observed, and metal samples taken at any time by raising the top.

At the conclusion of the test, the bottom is tapped, the metal is drained, and samples are removed. Dross accumulation and ease of cleaning are noted. The samples are then cut and the fracture is examined. All samples are stored to note any later deterioration.

We found this test reliable and prefer it to any cup or crucible test since it provides a large ratio of metal t refractory face. In addition, it is ru on standard brick representative c commercial products. Duplicates, or i many cases the same piece, can b used for determination of other pro erties.

We used 7075 alloy for periods c 100 and 200 hours at a temperatu of 1650°F. Samples of metal we analyzed before, after and at the mi point of each test. Since each test co tained several different refractory sa ples, this analysis was not intended t check alloy contamination, but to chec uniformity so that all fresh alloy coul be added in the event that long hea ing should render the metal less co rosive due to removal of one or mo elements.

These checks indicated about 0.3% reduction of copper and 0.5% redu tion of magnesium in 200 hours. In a cases, however, the alloy was still wit in the limits of published compositio so the bath was not changed durin the run.

In examining test samples, meanin ful quantitative measurements of pen tration or attack were almost impos ble to make. However, certain patter were noted that could be classified an used for descriptive notation. Thes patterns, classified as Types 1, 2 an 3, are illustrated in Fig. 1. This met od is preferable to photographs tha in the case of dark colored material are indistinct.

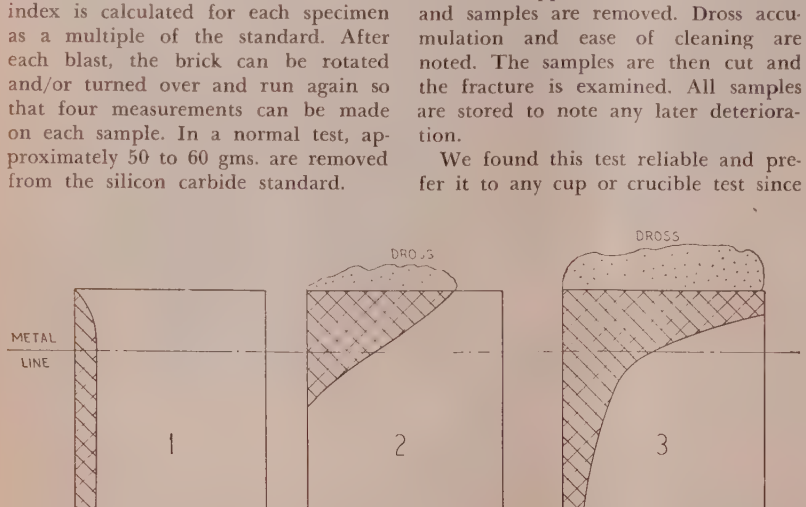
Type 1 penetration ranged fro 1/32-inch to as much as 1-inch deep In oxide materials, it showed as strong black line; in the silicon ca bides, as a shiny metallic zone again the black unpermeated body of th piece. This type of penetration wa characterized by freedom from dro and easy removal of metal.

Significantly, the depth tapered t nothing at the top of the piece tha faced the source of heat above the met line. The top portion, perpendicul to the exposed face, was clean and dr

Type 2 penetration showed dro buildup on the top face with met adhering to the exposed face only i front of the penetrated area. Below th penetrated area, metal could be r moved with relative ease. The dro was hard and refractory, frequent carrying some of the piece with it whe removed.

Type 3 was the most severe, sho ing penetration along the entire e posed face, accompanied by hea dross formation on the top. Cleani was difficult, and dross removal oft caused breakage.

Resistance to Cryolite. The sa apparatus and type of test were us for cryolite. A mixture of 95% cryol



■ ***Fig. 1. Types of penetration of refractories by molten aluminum and molten cryolite. Characteristics of each type are detailed at right.***

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and 5% Al_2O_3 was used at 1832° F. Because of the extremely corrosive nature of the material, about ½-inch of molten aluminum was first charged into the furnace to reduce the risk of bottom leakage.

Only a few materials were tested since most could be eliminated without trial. The test has been run only long enough to see vigorous attack begin on most specimens. This has occurred in 16 hrs. The results are discussed below.

In this study, over 50 different materials were examined. Properties were tabulated for significant compositions among the groups of ceramic-bonded silicon carbide, silicon nitride-bonded silicon carbide, and oxide materials.

Silicon Carbide; Ceramic Bond

Critical properties of the ceramic-bonded silicon carbides are shown in Table 1. Sample "A" is a body developed primarily for use at high temperatures and to withstand cyclic heating. It has excellent oxidation resistance, high strength over a wide range, and good abrasion resistance. However, it shows Type 3 penetration by aluminum and is, therefore, not satisfactory.

Sample "B" is a typical silicon carbide for general use. Its strength is good but falls off a little faster than with "A" as temperatures are raised. Some heat-shock resistance is sacrificed to obtain better abrasion resistance. Because of a denser structure, it is more resistant to penetration by aluminum, showing Type 1 pattern up to a depth of 1-inch. It does not collect or form dross, and is easily cleaned. It is cut by cryolite to a depth of about ½-inch.

Sample "C" is an alkaline-earth-bonded silicon carbide developed for resistance to oxidation at low temperatures. This resistance is attained by special treatment, so it is a little more costly than standard materials. Some high-temperature strength is sacrificed, but abrasion resistance is excellent and there is practically no penetration by aluminum (Type 1 to a depth of 1/32-inch). The refractory cleans easily and there is no dross formation. Cryolite cut it to a depth of less than ½-inch.

Sample "D" is another alkaline earth-bonded silicon carbide developed primarily for use in contact with aluminum. Its abrasion resistance is not as good as the others, but it shows Type 1 penetration by aluminum to a depth of only ¼-inch. It stood up better in cryolite than the other ceramic-bonded materials, showing a cut of no more than ¼-inch depth, and no noticeable penetration beyond the cut.

Sample "E" is typical of several developmental compositions in which attempts are being made to improve resistance to abrasion and aluminum penetration of materials like "D". This mix looks promising, with an abrasion index of 1.69 and Type 1 penetration to a depth of only 1/16-inch. It is clean and free from dross. Its resistance to cryolite is poor, being badly chewed and penetrated in the 16-hour test.

The thermal conductivity of all these materials is in the range of 100-109 BTU/hr, sq. ft. and °F/in. of thickness.

Silicon Carbide; Nitride Bond

Properties of the principal silicon nitride-bonded silicon carbides are summarized in Table 2.

Sample "A" is a product developed to resist aluminum and cryolite. Strength, abrasion resistance, and thermal conductivity are higher than any ceramic-bonded silicon carbide. It is not penetrated at all by aluminum, cleans easily and is free from dross. This material, tested in cryolite, showed no penetration or corrosion.

Sample "B" is a silicon nitride-bonded silicon carbide that resists severe abrasion. This service frequently requires highly-designed, intricate shapes made to close tolerances. It is a dense, relatively fine-grained product that is the most abrasion resistant of all bonded silicon carbides and shows no penetration by molten aluminum.

Sample "C" is a special grade of silicon nitride-bonded silicon carbide that gives maximum resistance to thermal shock. It, like the other nitride bonds, is excellent in abrasion resistance, and is not penetrated by aluminum.

Sample "D"—pure silicon nitride—shows characteristically good mechanical strength, and is not penetrated by aluminum. Its thermal conductivity is about 30% lower than the silicon carbides. It is not attacked by cryolite.

(Continued on page 38)

Table 1 – Critical Properties of Ceramic-Bonded Silicon Carbides

Type of Material	Modulus of Rupture @ 70°F—psi	Modulus of Rupture @ 2460°F—psi	Abrasion Index	Thermal Conductivity btu/hr @ 2200°F	Bulk Density gms/cc	Aluminum Penetration (200 hrs)
Sample "A"						
High Temperature Heat Shock	3210	2980	1.17	100-109	2.57	Type 3
Sample "B"						Type 1
Medium Temperature General Purpose	3331	2730	1.00	100-109	2.60	depth up to 1"
Sample "C"						Type 1
Resistance to Aluminum	3400	962	1.06	100-109	2.54	depth 1/32"
Sample "D"						Type 1
Resistance to Aluminum	2940	650	2.38	100-109	2.53	depth 1/4"
Sample "E"						Type 1
Resistance to Aluminum (Developmental)	4100	670	1.69	100-109	2.50	depth 1/16"

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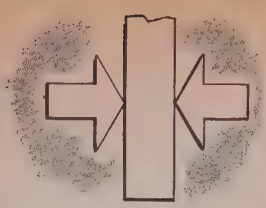

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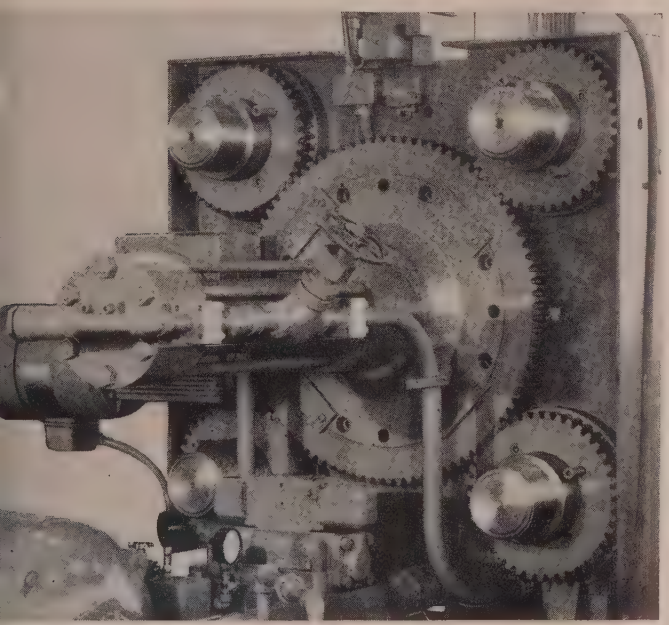

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Data on typical members of the oxide group are summarized in Table 3.

Sample "A" is a self-bonded fused alumina developed principally as a general purpose high purity refractory. Its thermal conductivity is the highest of the oxide group, but is still only about 25% that of the silicon carbides. This type of refractory shows Type 2 penetration but, because of its purity, shows no dross buildup. In spite of the penetration, the surface is easily cleaned.

Sample "B" is a fused alumina using a ceramic or silica-containing bond. Purity and strength at extreme temperature are sacrificed to obtain better low temperature performance and abrasion resistance. It is penetrated as in Type 2, and shows moderate dross.

Sample "C" is a ceramic-bonded electric furnace mullite. The main property determining its usefulness is its ability to bear loads with no deformation at extreme temperatures. It withstands cyclic heating better than other oxide-bonded materials. It is still an alumina-silica refractory and aluminum penetration is Type 2.

Sample "D" is a pressed zircon brick that has good refractory qualities, and completely resists penetration by molten aluminum. It cleans easily and dross buildup is absent.

Sample "E" is a specially densified zircon. It completely resists penetration by aluminum. Metal is removed easily and it is completely free from dross. Its good abrasion resistance, exceeded only by that of nitride-bonded silicon carbides, invites attention.

Sample "F" is a hydraulic-setting castable cement composed essentially of calcium aluminate and fused alumina grain. This sample was cast and dried, being subjected to no heat other than that of the test conditions. While its mechanical properties are not as good as the prefired ceramics, its lack of penetration by molten metal is significant. Improvement of mechanical properties appears possible, and its resistance to metal makes it a promising material for further development.

Sample "G", an experimental phosphate-bonded alumina, was fired to 2650°F after forming. Its mechanical properties are quite good, but its ability to stand up under load is deficient when compared to the other refractories. In a 100 hour test, it is not penetrated by aluminum. In a 200 hour test, however, it showed Type 2 penetration. Dross buildup on the top and above the metal line was heavy; removal could be accomplished only by breaking off chunks of refractory. Below the penetrated area it cleans well.

Phosphate-bonded materials can also be cured at temperatures as low as 600° F. Material so cured developed good strength, but was penetrated to a depth of about ⅛-inch in 100 hours. It was covered with a film of tightly-adhering dross, from which it was difficult to remove chilled metal.

Among the few other materials of interest whose properties cannot be tabulated readily are the products made from alumina bubbles. These can be produced as fired shapes with thermal conductivity in the range of 5-7 BTU/hr, sq. ft. and °F/in. of thickness. Kiln-fired products are penetrated by molten metal so they are not useful for contact work. But they are of value for thermal insulation and are stronger and more volume-stable than ordinary insulating brick.

These bubbles can also be bonded with calcium aluminate to form hydraulic cements that are cast in place. These cements have low thermal conductivity, as do the fired products, but resist penetration by molten aluminum. They were tested in our standard test. They were not penetrated, but a skin of metal adheres mechanically which, upon removal, peeled a thin layer of refractory with it.

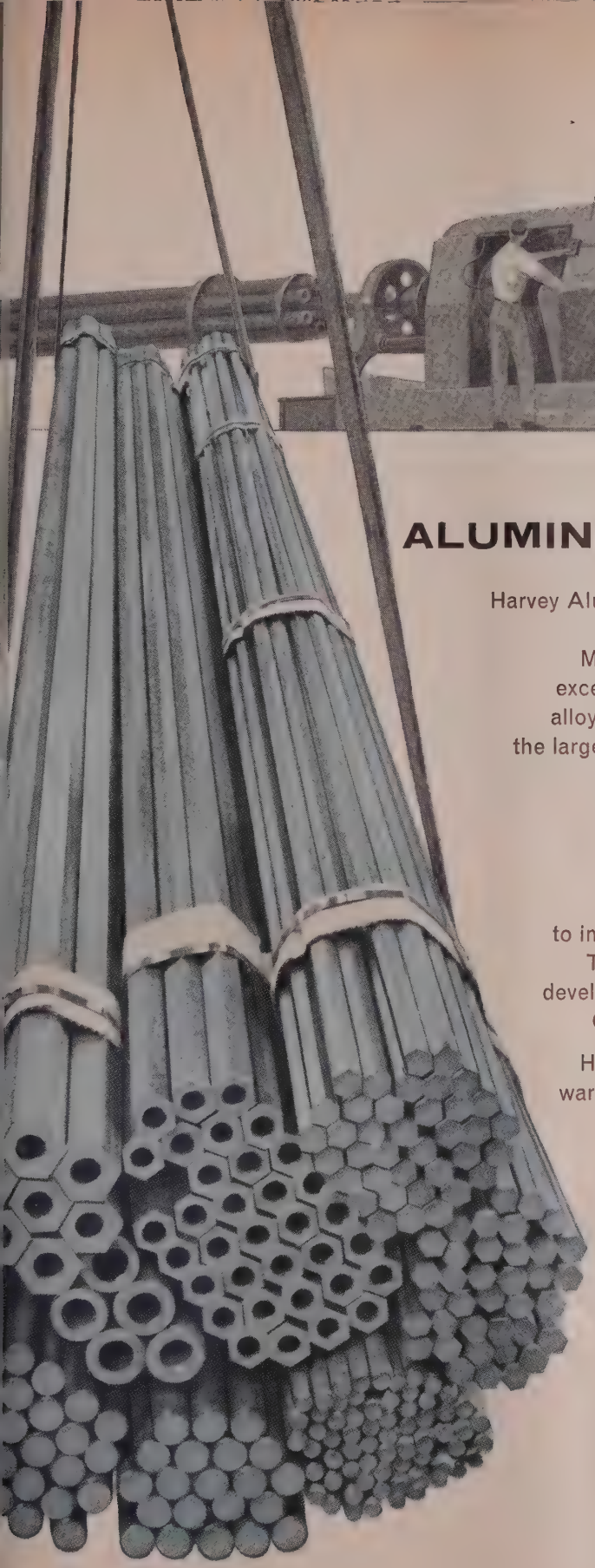
Versatile Ceramic Fiber

A final material to be described is ceramic fiber. It is available in so many forms that test data should be the subject of a separate paper. Made into paper, blanket, textiles, rope, coatings and rigid shapes, it is an excellent thermal insulator. Its "K" values vary with the density, but all forms lie in the range of about 0.5 to 1.5 BTU/hr, sq. ft. and °F/in. of thickness at 1000° F.

Because of their fibrous nature, rigid bodies are almost indestructible by thermal shock. Of particular importance is their resistance to wetting and penetration by molten aluminum. This is unusual because the high-silica content would suggest otherwise. However no silicon pick-up by metal was observed in 72-hour cup tests at 1300° F. The only explanation that can be of

Table 2 – Properties of Silicon Nitride-Bonded Silicon Carbides

Type of Material	Modulus of Rupture @ 70°F—psi	Modulus of Rupture @ 2460°F—psi	Abrasion Index	Thermal Conductivity btu/hr @ 2200°F	Bulk Density gm/cc	Aluminum Penetration (200 hrs)
Sample "A" Resistance to Aluminum and Cryolite	5261	5508	0.90	113	2.62	nil
Sample "B" Shapes, Abrasion Resistance	6010	7668	0.22	113	2.74	nil
Sample "C" Superior Heat Shock	3278	5884	0.73	110	2.58	nil
Sample "D" 100% Silicon Nitride Cryolite Resistance	7221	6570	0.72	70-80	2.45	nil



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fered is that the silica, present in non-crystalline or amorphous form, is not reactive.

Having reviewed the properties of these materials, there arises the mutual problem of working out ways to take economical advantage of them.

Reduction Cells. The first area is in reduction plants. Two obvious goals are to decrease maintenance and increase output of existing cells. The principal properties demanded of refractories to accomplish this are thermal conductivity, resistance to metal, resistance to cryolite, and sufficient strength to permit thinner walls.

Silicon nitride-bonded silicon carbide appears to be ideally suited to these conditions. One disadvantage is that cost is considerably greater than for ceramic-bonded silicon carbides. The only limitation of the latter is susceptibility to attack by cryolite. But the high thermal conductivity offsets this by allowing the formation of a frozen ledge of electrolyte which prevents corrosion.

There are times, however, where over-heating or local disturbances temporarily remove this protection. In specific areas where this occurs the silicon nitride-bonded material can be used. By confining it to these areas, an economically balanced life can be obtained.

The high thermal conductivity further helps to dissipate heat and quickly restore balanced conditions. The strength and thermal conductivity permit construction of thinner walls, thus enlarging the working space of existing cells. These same properties provide for more rapid heat dissipation, permitting increased current densities without overheating.

These comments relate to standard reduction cells. Existence of materials that can withstand the severe corrosion of the reduction cell stimulates conjecture to possible new designs. Example: What would today's cell look like if silicon nitride or other similar materials had been available to the designers of the first cells?

Anode Baking. Another area in the reduction plant where special refractories can be of value is in anode baking equipment. Ceramic-bonded silicon carbide, being a strong material with high thermal conductivity, is useful in many furnaces to provide strength and uniform temperatures.

The mullites can give good service when used as burner blocks and supporting piers. Borrowing from the ceramic industry, silicon carbide can be used as an efficient muffle for a continuous kiln.

Since many anode mixes contain scrap anode material, they may give off fluoride vapors during baking which attack the furnace refractories. In this situation, the nitride-bonded materials might be justified.

Melting and Holding. Silicon carbides have been used widely for many years in furnace and ladle linings. They give long life and clean metal because of their resistance to penetration, to impact, and to abrasion. They are cleaned more easily and are much less damaged during cleaning.

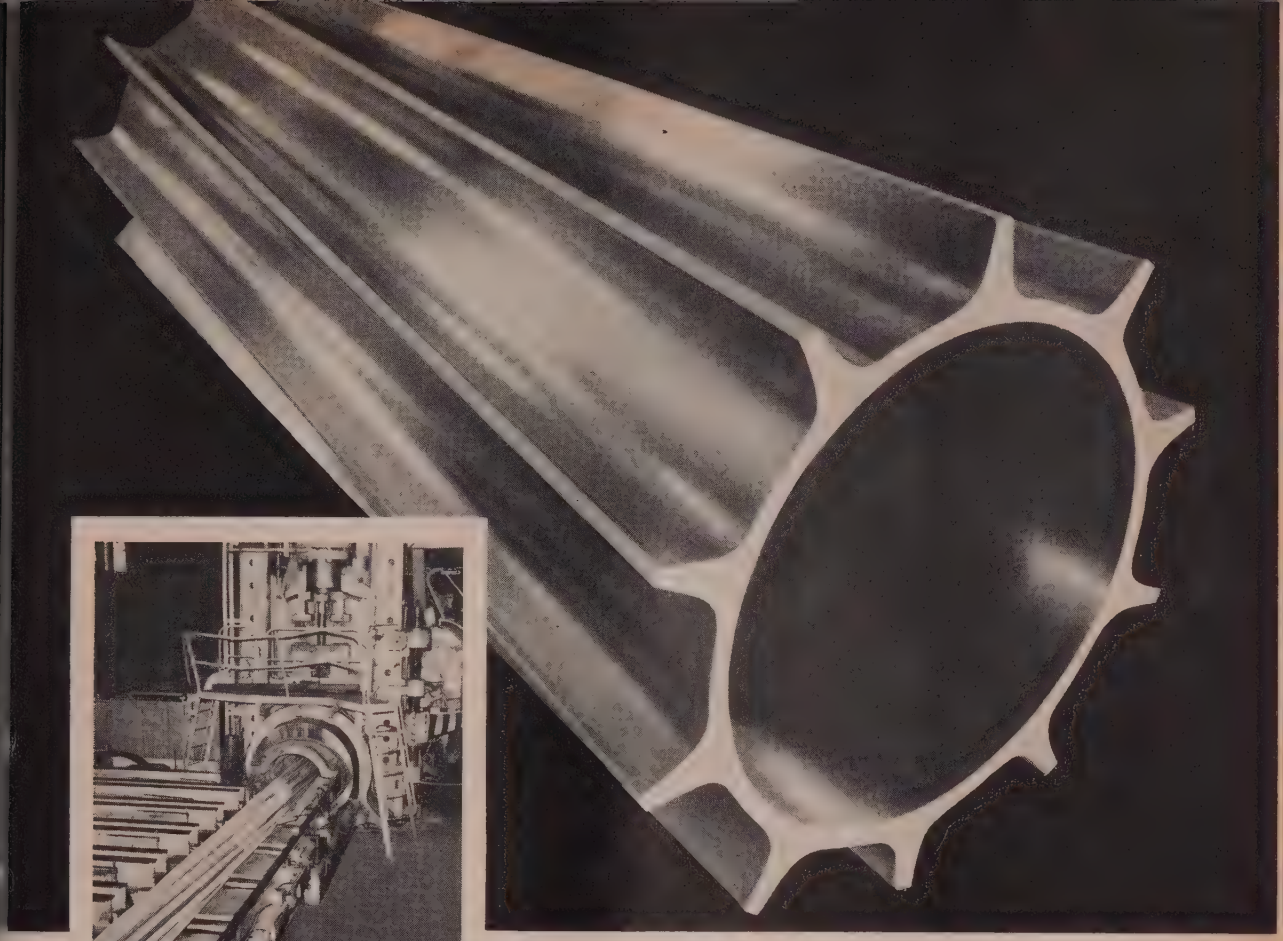
Advantage is taken of the high thermal conductivity for the construction of hot walls. The abrasion resistant, ceramic-bonded silicon carbide, or the silicon nitride-bonded materials, find applications as furnace bottoms and charging ramps where refractories are subject to severe abrasion and mechanical impact.

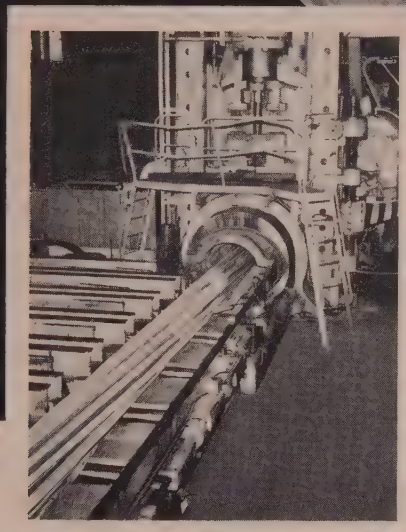
In many of these cases, the more expensive silicon nitride-bonded refractory is confined to the area subject to the most severe condition. The remainder is filled out with a ceramic-bonded grade. Their thermal shock resistance and other properties enable silicon carbides to perform well as door jambs and sills, particularly on cleanout and skimming doors.

Away from the zones of metal contact in the melting furnace, some of the

Table 3 – Properties of Typical Oxide Refractories

Type of Material	Modulus of Rupture @ 70°F—psi	Modulus of Rupture @ 2460°F—psi	Abrasion Index	Thermal Conductivity btu/hr @ 2200°F	Load % Subsidence @ 2732°F 25 psi, 50 hrs	Aluminum Penetration
Sample "A"						
Bonded Fused Alumina 99%	2400	620	6.80	24	1.5	Type 2 - 100 hrs with little dross
Sample "B"						
Fused Alumina Ceramic Bond	3581	1571	1.35	21	2.4	Type 2 - 100 hrs
Sample "C"						
Bonded Electric Furnace Mullite	1955	1356	2.80	16	0.1	Type 2 - 100 hrs
Sample "D"						
Zircon	1338	832	2.56	20	2.2	nil - 200 hrs
Sample "E"						
Zircon, Cast	5680	4367	0.47	20	0.6	nil - 200 hrs
Sample "F"						
Castable Cement-Fused Alumina	1700	367	3.70	20	6.2	nil - 100 hrs
Sample "G"						
Experimental Phosphate Bonded Alumina	2625	614	1.13	18	15.6	nil - 100 hrs Type 2 - 200 hrs





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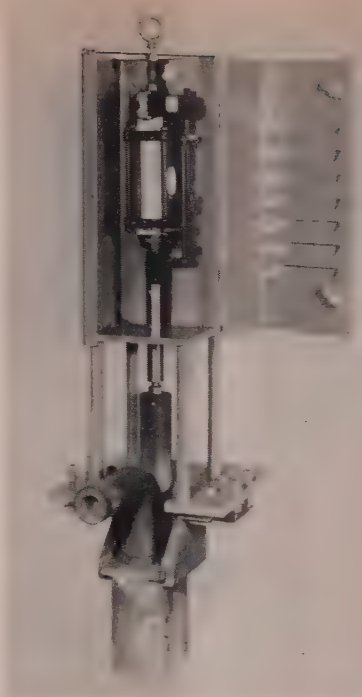
Mullite refractories also find use in these furnaces as burner blocks, where they must withstand extreme temperatures and fluctuations as burners respond to demand changes.

Metal Handling. This covers numerous hardware type applications where resistance to metal attack, ease of cleaning, and resistance to thermal shock and abrasion make the silicon carbide materials suitable. To take advantage of these properties, techniques have been developed to form highly intricate shapes to close tolerances.

Since the principal cost of such pieces is in forming, the techniques have been applied principally to the silicon nitride-bonded products.

A piston type pump (Fig. 2) shows how far these techniques have been developed. This pump has a piston operating in a cylinder, with all necessary joints, valves and seals. Metal-contact parts are made of silicon nitride-bonded silicon carbide. Because of the hardness of the fired product, all dimensions must be established in the unfired parts. After final assembly, the entire pump is nitrided to give a homogeneous, leak-free structure.



■ ***Fig. 2. Metal contact parts of this piston-type molten metal pump are made of nitrided silicon carbide refractory.***

Similar techniques have been used to make centrifugal pumps. Even the bolts were made of this refractory.

These techniques, applied to this material, provide refractories for use in pyrometer tubes, launders, troughs, pipes, pipe fittings, siphons, tap-out blocks, floats, valves and devices for metering and regulating metal flow.

Often, ceramic-fiber is useful as gaskets, seals, and expansion joints. The fiber can be a semi-rigid pipe (see front cover) for transporting metal. Because of its insulating value, it may be used alone for short lengths. For longer runs, silicon carbide piping can be used with external heaters to prevent metal chill. Wrapping such heated pipe with ceramic fiber reduces the heat-input requirement.

A ceramic-fiber coating material has been made that shows promise in protecting cast iron, and in extending the life of graphite chlorine-injection tubes.

In Induction Furnaces . . .

Another application in which special refractories have been combined to do an effective job is in induction melting furnaces. In one widely-used furnace the metal flows vigorously through refractory-lined channels between the inductor windings. Erosion is severe and metal penetration can short out the windings. Rammed linings have given satisfactory performances in many cases but a field repair is time consuming and variable.

Hydraulic-setting, alumina-bubble castable cements shorten the repair time and give good resistance to penetration, but are susceptible to erosion and difficult to clean. What appears to be a successful solution is the use of a factory-made, one-piece silicon nitride-bonded channel liner (Fig. 3) which is put in place and backed up by the alumina-bubble castable cement.

A final noteworthy application is in the aluminizing of steel wire and sheet. Resistance to abrasion and metal, coupled with the ability to fabricate precision parts, again make silicon nitride-bonded silicon carbide ideally suited for use as sinker rolls and guides.

This operation also imposes a requirement for metal purity and freedom from buildup and granular inclusions that scratch or mar the coating. This has led to a relatively lavish use of silicon nitride-bonded materials for melting and handling molten metal. In one method, silicon nitride-bonded tubes fitted with gas burners are used as immersion heaters to maintain clean, uniform heat.

This review of properties and applications has attempted to give a broad view of the activity of the special refractories industry. Work is continuing to improve present materials and develop new ones, expecting that it will prove of value to the aluminum industry. The possibilities outlined here may stimulate imagination in solving some of the engineering problems.

■ ***Fig. 3. One-piece channel liner for induction melting furnace is nitrided silicon carbide. It is backed up with hydraulic setting alumina-bubble castable cement.***

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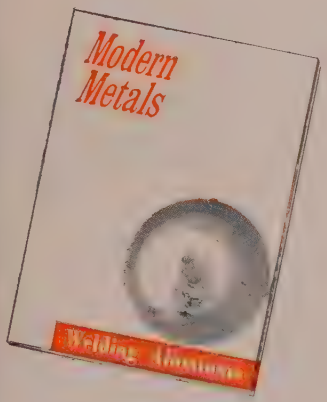

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MIG-Welded Aluminum Dump Trucks Minimize Asbestos Mill-to-Mill Costs

Aluminum bottom-dump trailer trucks are being used by a Canadian asbestos company to transport 200 tons of ore each hour from crushing to processing facilities. By using welded-aluminum trucks, the firm saved on original truck construction costs; has minimized shipping and maintenance expenses.

WELDED aluminum bottom-dump trucks will save a Canadian asbestos company a hopper full of transportation dollars — $85,000 on equipment, $68,000 on annual operating expense, and an incalculable amount on maintenance.

This is what Atlas Hoist and Body Co., of Montreal claims. Atlas should know; it designed and built two trucks for Asbestos Corp. Ltd. so the company could economically haul ore 1½ miles from crushing facilities at its Old King mill site to a new processing mill at Thetford Mines, Quebec.

The new mill gobbles up 200 tons of crushed ore per hour, 24 hours a day. To meet this need, the firm's preliminary estimates called for three rear-dump trucks with 27-ton capacities. But further examination proved such a program would be too costly. Equipment would require an outlay of $150,000, not including operating expenses.

It was finally decided that to economically haul ore over the short distance, two 40-ton capacity trucks were needed. But steel trailers available for carrying such loads weighed 28,000 pounds. This dead weight, plus the lading, would necessitate use of heavy traction drive units to pull the entire load—something the company wanted to avoid.

An aluminum bottom-dump trailer hauled by a standard highway tractor could do the job, but no existing manufacturer made such a carrier.

At this point, Atlas was called in to design and build a body to Asbestos Corp.'s specifications. Two units were planned and fabricated from Alcan 54S aluminum plate in thicknesses ranging from ¼ to ¾ inch. Total weight was only 15,000 pounds, enabling a 275 horsepower tractor to make a round-trip in 10 minutes 35 seconds while hauling its 40-ton loads up a 2% grade.

Trucks Manually MIG Welded

The two units were fabricated in Atlas' Montreal shop. All joints were metal-inert-gas (MIG) welded using Air Reduction Co. Aircomatic manual guns.

To weld floor assemblies, work was positioned so most of the fillet welds could be made in flat or horizontal positions. A push type wire-feed gun was used to tack weld the assemblies with 3/64-inch 5056 aluminum wire.

Welding of body sides and ends, or general out-of-position welding, was done with a pull-type gun using 1/16-inch 5056 aluminum wire, fed at speeds of 255 ipm. Pure argon shielding gas was used in both units, at a flow rate of 45 to 50 cubic feet per hour.

By combining aluminum and MIG welding, the two dump units were fabricated at a cost of $65,000, a saving of $85,000 compared with the steel models originally contemplated.

To operate the aluminum trucks, Atlas has budgeted $68,000 less than it expected would be needed for three steel units. Further economies are expected from the faster turn arounds afforded by bottom-dumping, and the reduced deadweight of aluminum bodies. Aluminum's low maintenance requirements will keep costs down, too.

Atlas also manufactures aluminum bodies of 15 cubic yard dump capacities. They measure 14½ feet long, 7 feet wide and 4¼ feet high, and weigh 4200 pounds — about 2800 pounds lighter than similar steel units. Aluminum mining dump trucks are also made their weight being about half that of comparable steel dumpers.

■ *Weldor (at left) fillet welds floor assembly of aluminum bottom-dump trailer using manual MIG welding gun. Atlas Hoist and Body Co. made two trailers (one shown above). They weigh 15,000 pounds, but have 40,000 ton capacity. Trailers are pulled by 275-hp tractors.*

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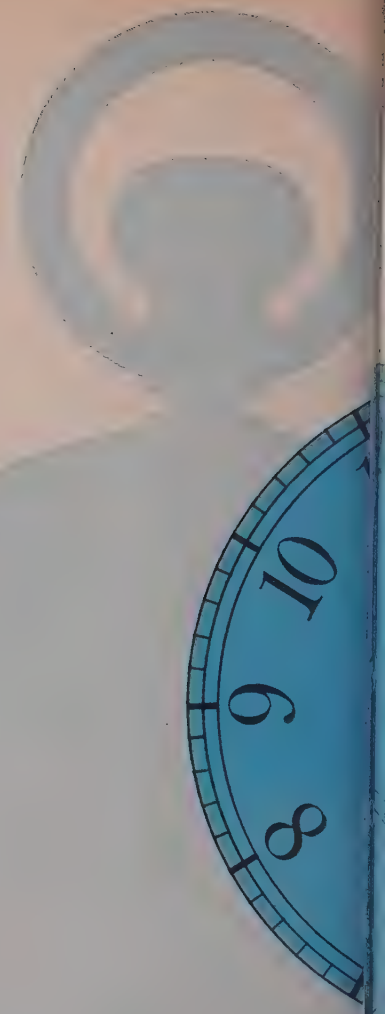

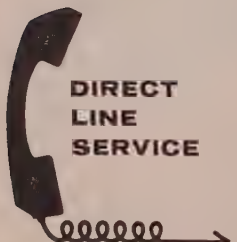

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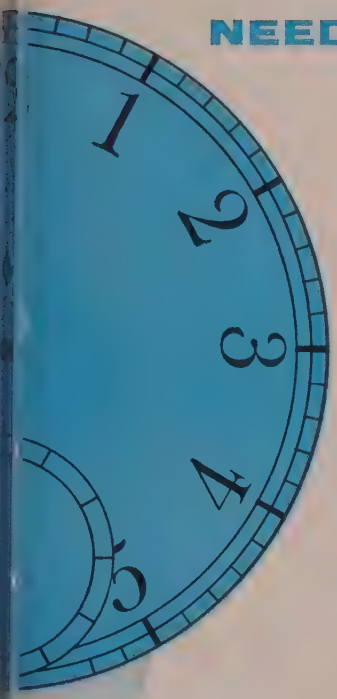

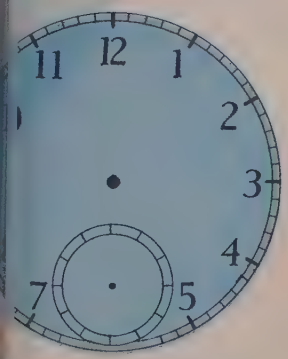

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NEW FURNACES PROVIDE ACCURATE ANNEALING OF ALUMINUM SHEET

High capacity, fast loading and unloading, accurate automatic controls are some of the worthwhile features of Reynolds' alloys plant installation at Sheffield, Ala.

NEARLY 600 tons of coiled aluminum sheet can be annealed simultaneously in ten new controlled atmosphere furnaces now in operation at the Reynolds Metals Co. alloys plant in Sheffield, Ala.

Designed, built and installed by the Sunbeam Equipment Corp., Meadville, Pa., four of the furnaces have a rated capacity of 225,000 pounds each, while the other six are of 150,000-pound rated capacity. They were installed as part of the plant's multimillion-dollar expansion program, which includes the world's largest aluminum rolling "hot line," according to plant manager D. H. Hipp.

The 225,000-pound furnaces are of the double-door type for fast loading.

Temperature range is from 300° to 1000°F, and is regulated by a complex system of controls built by Leeds & Northrup Co., Philadelphia 44, Pa. The system controls the heating, soaking and cooling stages of the cycle.

The furnaces were built to Reynolds' specifications, calling for heating of full loads in either vertical or horizontal positions from 70° to 900°F in eight hours. Cooling capacity is specified as from 900° to 450° at an even rate of 50° per hour.

At peak consumption, the 36 burners in the larger furnaces burn 24,000 cubic feet of natural gas per hour. Heating is by radiant tubes in the furnace walls. The work chamber is protected from radiation by corrugated baffle walls.

The larger furnaces have six individually controlled heating zones, each with a 100-hp recirculating fan moving air at upwards of 60 mph and 60,000 cfpm in each zone. Air flow is downward through distribution baffles on the load and then up between the side baffle walls and the sides of the furnace to the radiant tubes.

Load cooling is by forced circulation of part of the gas atmosphere past aluminum finned tube heat exchangers and back into each of the zones. Atmosphere temperature can be reduced from 900° to 120° each time it moves through the cooling chamber. A bypass damper system permits variable cooling.

The new annealing furnaces are in addition to five similar controlled atmosphere furnaces previously installed.

Load size of the four double-door furnaces is 37½ feet long, 12 feet wide, and 9½ feet high. The six smaller furnaces have the same width and height but take loads up to 25 feet long.

The six single-door furnaces are each designed to handle two trays 12 feet wide by 12½ feet long, each holding up to 75,000 pounds of aluminum coils. The double-door furnaces handle three trays of the same size and capacity.

The furnace walls and doors are insulated with four inches of 1700° insulating block and four inches of wire reinforced rock wool.

The inert gas used in the controlled atmosphere furnaces is produced in six gas generators with a total capacity of over 200,000 cubic feet per hour. The final product entering the furnaces is approximately 88% nitrogen, 10% carbon dioxide and less than 1% each of hydrogen and carbon monoxide. Oxygen content is less than 200 ppm.

A three-stage cooling process lowers the gas temperature to 40° to permit condensation of moisture before the gas enters the furnaces. A total of 95 tons of refrigeration is available for cooling.

Hipp said the controlled atmosphere furnaces were designed to maintain the brightness of aluminum sheet during annealing.

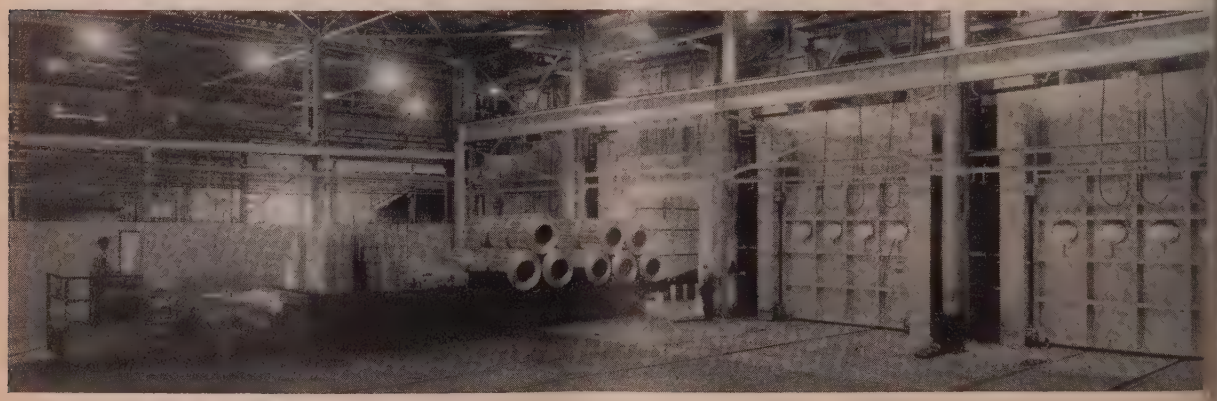
The Annealing Cycle . . .

Operation of the furnaces after loading begins by setting the controls at the purge temperature (under 400°) and introducing inert gas until the oxygen analyzer-recorder shows only traces of oxygen in the furnaces.

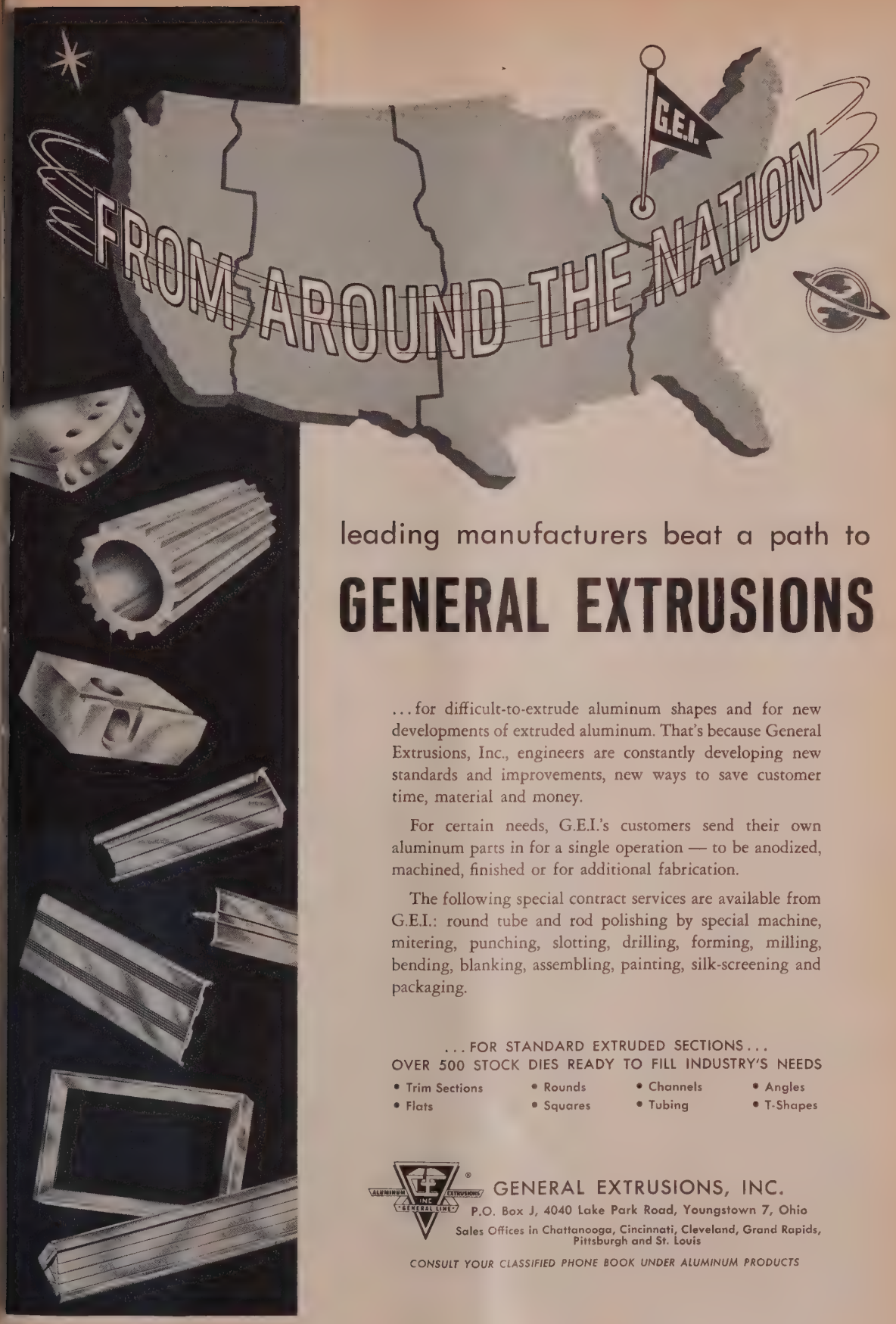
Then the operator sets the furnace air zone temperatures as needed. When the "cold" thermocouple in the furnace reaches the low control point, an automatic two-hour soak timer cycle begins. Usual soaking time, according to Lawrence Goins, superintendent of sheet finishing, is two hours.

Complex automatic controls maintain temperatures and atmosphere content as programmed during heating, soaking and cooling cycles. The furnace operator makes the end-of-cycle cut off as the load temperature goes below 450°.

The actual annealing cycle consists of heating the aluminum coils to a pre



■ *Some of the new Sunbeam controlled atmosphere annealing furnaces that are now in operation at Reynolds Metals Co.'s Sheffield, Ala. plant. Complex controls assure accurate regulation of heating, soaking, cooling stages of annealing cycl The units are designed to maintain brightness of the met during the operation.*



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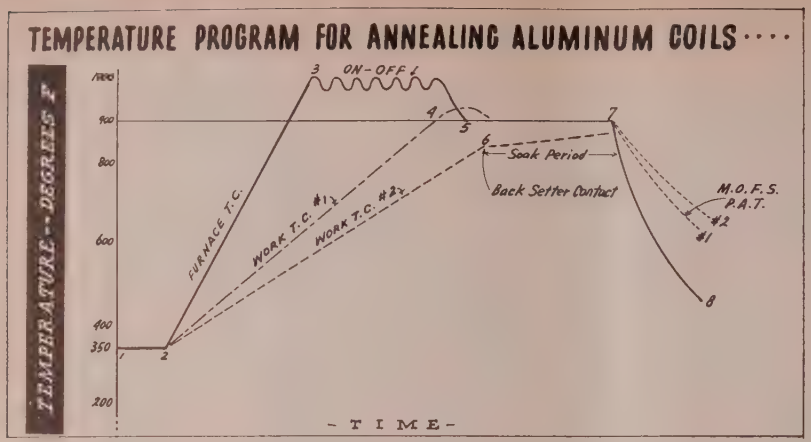


determined annealing temperature, hold the coils at this temperature for a predetermined period of time, and cooling the coils at a predetermined rate of cooling to a minimum temperature, at which time they can be removed.

Heat, Soak, Cool Control

During the heating and soaking portions of the annealing cycle, temperature is regulated by the individual furnace zone temperature controllers through the metering of fuel to the radiant tube burners. During the cooling portion of the cycle, temperature is controlled by the multiple-point work temperature controller through the regulation of the portion of the circulating atmosphere which passes through the external cooler.

The temperature in each heating zone is measured by an iron-constantan thermocouple. Two work temperatures are measured in each furnace — one in a section of the load that heats quickly, the other in a section which heats slowly. Occasionally, additional work temperatures may be measured.

Each zone temperature is recorded on a Speedomax G Strip Chart Recorder Controller which is equipped to provide accelerated heating control. The final or soak temperature control point of this instrument is indicated on the scale on the front of the instrument, and is set by means of a front-setter. The zone temperature is controlled at this point through duration adjusting type proportioning control.

Control points are transferred automatically from the initial to the final point by means of the work temperature recorder. The D.A.T. controller includes a rate of approach setter which controls the rate at which the zone temperature approaches the final control point from the initial control point.

Two work temperatures are recorded on a multiple point Speedomax Type G Strip Chart Recorder Controller. Point #1, the more rapidly changing work temperature, is associated with the control point indicated on the recorder scale and set by the front setter.

This control point is motorized and provides for controlled cooling of the work through P.A.T. control of the cooling dampers. This control point also includes an extra contact which resets the zone temperature controllers from the initial to the final control points, whenever the work temperature reaches this set point.

The multiple point recorder is also equipped with a deviation back-setter which is calibrated over a 100° span below the front set control point. This deviation setter includes a contact associated with Point #2 for actuation of the soak timer.

Whenever the more rapidly heating work temperature reaches the front set point, the zone temperature controllers are automatically transferred from the initial control point to the final control point. Whenever the slower heating work temperatures reach a temperature which is a preset amount below the front set control point, the soak timer starts indicating that the entire load is within the prescribed soak temperature.

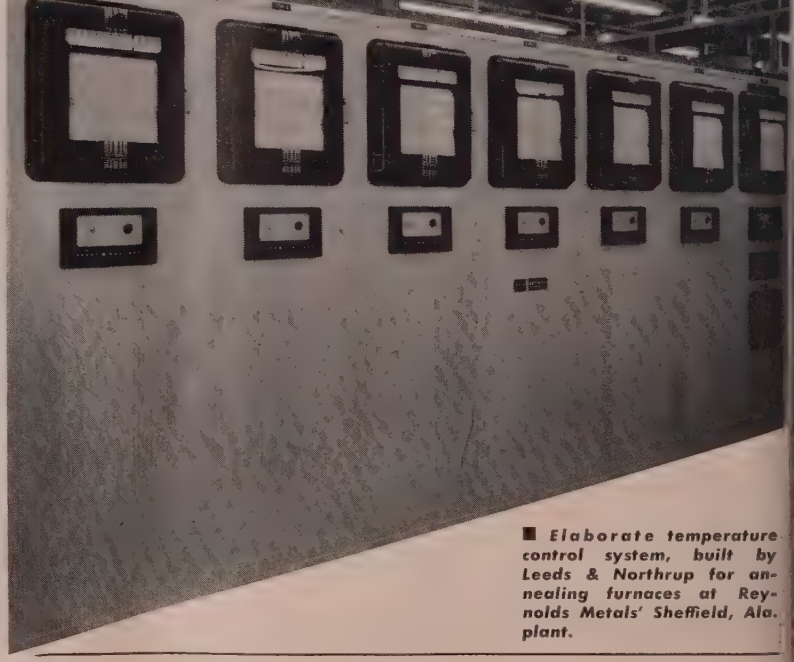
When the soak timer times out, the fuel supply to the radiant tube burners is shut off, control of the furnace is transferred from the zone temperature controllers to the #1 point of the multiple point work temperature controller and the motorized front-setter commences to operate downscale to provide controlled cooling of the work. Also, when the soak timer has timed out, a contact is provided for external connections to a Sunbeam circuit for starting the cooling fan and opening the cooler slide dampers.

The multiple-point recorder is equipped with a program selector switch mounted on the door of the instrument to enable the operator to reset the program at the beginning of an annealing cycle. Whenever the program is reset, the cooling damper drive unit is automatically operated to a limit which opens the cooler bypass damper wide and closes the cooling air inlet dampers.

The work temperature control panel includes five signal lights across the top which indicate the following conditions:

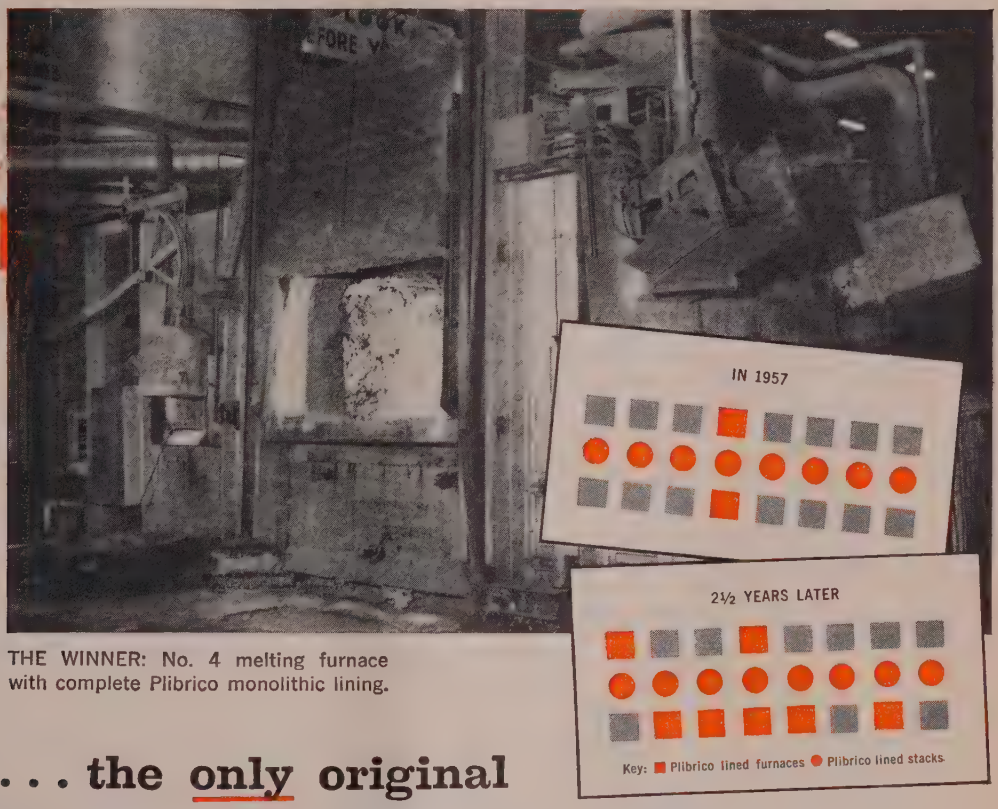
1. **Initial control point**
2. **Final control point**
3. **Soaking**
4. **Controlled cooling**
5. **Alarm**

The alarm signal light will indicate overheat temperature in any zone, loss of fuel-gas pressure, or loss of combustion air pressure.



■ ***Elaborate temperature control system, built by Leeds & Northrup for annealing furnaces at Reynolds Metals' Sheffield, Ala. plant.***

Major aluminum producer tested 8 different furnace linings on a diet of molten aluminum**



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RESULT: After 2½ years, only one melting furnace had its original lining . . . the Plibrico-lined No. 4 is illustrated. Small wonder then that 4 additional melting furnaces now feature test-proven Plibrico linings. Even one additional holding furnace, where conditions are less severe, is now Plibrico-lined.

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Explosive Forming Big Radar Reflectors

The new technique has many advantages, including relatively low-cost tooling, close tolerance capability, fast production. Ryan Aeronautical Co. has much experience in this work.

EXPLOSIVE forming, the newest metalworking technique, is being performed by the Ryan Aerospace Div'n of Ryan Aeronautical Co. at its explosive forming facility in San Diego, Calif. Giant radar reflectors, the largest fabrications of their kind ever made by Ryan, are the product.

Several of the aluminum mirrors, measuring 78 inches in diameter and 22 inches deep, are being produced for Sylvania Electric Products, Inc., Waltham, Mass. The reflectors are used in an improved type of military radar installation.

A 35-ton ductile iron die, the heaviest ever made for use in Ryan's explosive forming process, is an indispensable element in the forming process. The great weight of the die enables Ryan to maintain contour and dimensions in the mirror's parabolic shape within one or two thousandths of an inch.

Ryan reports that, in addition to iron dies, techniques have been developed to construct the die in the ground either of concrete with an epoxy face, or of concrete with a steel face.

"Immense dies may be constructed in this way," a Ryan spokesman explained.

Advantages of explosive forming, as compared to conventional multi-ton press forming, are said to be numerous. Primarily, the extremely high pressure of explosive forming is distributed equally in all directions through a fluid medium, such as water, surrounding and within the die.

Springback Minimized

Shock wave impact causes the material to conform almost instantly to the die contour. Little springback is experienced relative to conventional die forming.

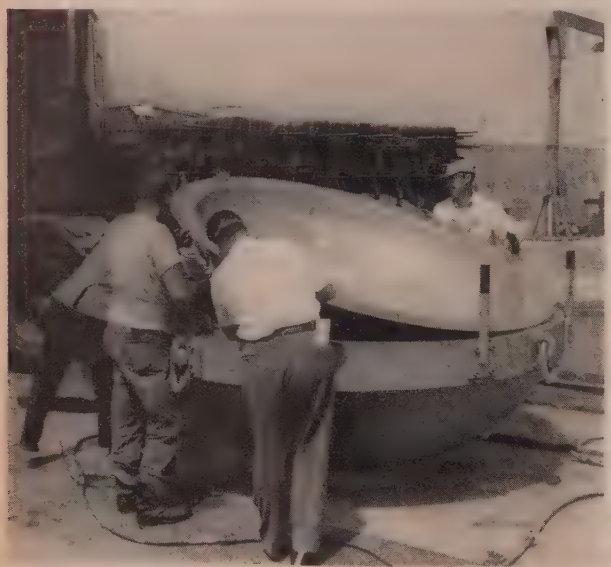
"In the case of very large dies, the die itself becomes its own tank of water," a Division technician said.

The explosive forming process insures uniform stretching and stressing of the material. Wall thickness of the finished product in many cases may be controlled to suit product requirements.

Simplicity of equipment and tooling are advantageous economic factors, especially in producing very large hemispherical pieces, Ryan points out. Parts that are extremely large, parts with unusual contours and close tolerance parts and parts requiring heavy pressures generally lend themselves to explosive forming. For these reasons they are produced more economically than by conventional methods.

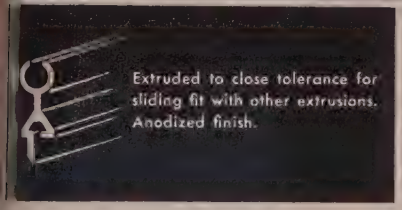
A 25-foot diameter explosive forming pit, the largest of three such pits at the Ryan facility on Kearny Mesa in San Diego, is being used for shaping the reflectors.

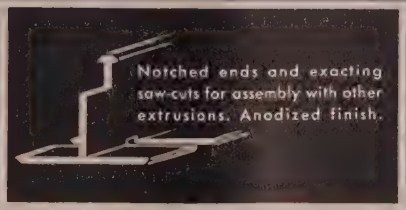
Ryan is a veteran in this important new metalworking activity, having already formed hundreds of differently shaped, intricate parts from a variety of tough alloys during a three-year pioneering period. The process is attracting the interest of many companies throughout the nation for solution of difficult fabrication problems.

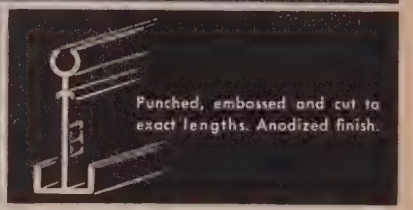


■ *Loaded die ready for explosive forming process (left). Flat stock is securely edge-clamped by circular die-cap. Primacord explosive (not shown) is positioned just above blank. After explosive forming and removal of die from tank, die-cap is removed. Photo at right shows part being removed from die after final sizing. Material used for this piece is 6061-0 aluminum, .140-inch thick, 79-inch diam. Formed part is 22 in. deep. Technical advantages are numerous; tooling is economical*

when you design a new product, remember....







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ALUMINUM'S PACKAGING SALES GOAL:

235,000 Tons Annually by 1965

Foil-paper cans, container ends, many futuristic foil packaging ideas are expected to lead way toward increased sales, say experts at recent AMA Packaging Exposition.

NOT too long ago, the packaging market was dominated by materials such as waxed paper, cellophane, glass and tinplate. But with packagers spending anywhere from $17 to $20 billion a year to put their merchandise into sales-stimulating bottles, bags, boxes and cans, it made sense for the aluminum industry to go after a slice of this lucrative business.

The success of their endeavor was abundantly evident at the Packaging Exposition held recently in Chicago by the American Management Association. And if the aluminum producers' predictions pan out, future gains should eclipse past accomplishments.

For example, Alcoa sees demand for aluminum in cans, foil containers, closures, etc. soaring from the 248 million pounds consumed in 1960 to something like 470 million pounds annually by 1965. William Turbeville, Alcoa's foil sales manager, notes that 85 million pounds of foil were used in packaging last year, but that advances in foil pouches, overwraps and laminations will boost the total to over 110 million pounds by '65.

Only five years ago 22,250,000 pounds of aluminum filled rigid foil container requirements. But consumption jumped to 52 million pounds in 1960, and Alcoa expects it to climb to about 70 million pounds within five years.

R. H. Lucas, Kaiser Aluminum's industrial foil and container sales manager, looks for a 7 million pound rise in packaging foil sales this year alone.

Reynolds Metals Co. says this year will be a good one for aluminum packaging; that domestic sales will jump $20 million. Paul Murphy, Reynolds vice-president, makes this prediction and says that cans will account for half of the increase. More than 60 million pounds of aluminum will be processed into cans this year, he says.

Shown at the Show . . .

At the recent packaging show, 46 of the 372 exhibitors displaying coated, laminated, embossed, and printed foil for use in bags, cups, crimped, pressed and formed trays, labels, overwraps and cans. Heavier gauge aluminum was shown to a lesser degree for closures, rigid cans, aerosol containers and impact extruded collapsible tubes.

Most interesting development was a can made of aluminum foil laminated to kraft paper. Produced on conventional spiral-wound container equipment, it is composed of two layers of kraft paper with an aluminum foil exterior serving as a moisture barrier and can label, and a vinyl coated foil interior.

Laminated containers such as this have been used for a long time to package such items as cookie and dinner roll dough. But now the can makers and primary aluminum producers are pushing the laminate as a pack for liquids—oil, paint, juice, and the like.

Anaconda Aluminum Co., Louisville, Ky., developed the Foil-Kan in conjunction with R. C. Can Co., St. Louis. The can has been market tested as a container for frozen juice concentrat and R. C. is supplying 6 million of t 6-ounce shells to Southern Sun, Dun din, Fla.

Main advantage claimed for t paper-foil can is economy. According its developers, the juice can costs abo $4.50 less per thousand to make tha tinplate cans, and $3 less per thousar than aluminum. Shipping costs are le than for tinplate, but equal to alum num with both types weighing in 47 pounds per thousand.

Very important to the future of th can is speed of manufacture whi ranges from 500 to 600 a minute. Th is about twice as fast as the rate f conventional aluminum cans, almost fast as the production rate of tin ca

A special sealing method makes th laminate container suitable for liquic claims Anaconda. All interior sear are made by overlapping the vin coated foil to create a metal-to-met contact and an all-metal interior whi won't leak.

Alcoa was showing its paper-foil ca which was market tested in Providenc R. I., last September as a pack f Minute Maid orange juice. Alcoa sa the tests were very successful, but r leased no data.

Foil-Paper Oil Cans?

The paper can is being extolled as container for citrus juices and mot oil—two areas in which sheet aluminu cans have scored heavily. Why, the are the aluminum companies introdu ing paper containers for these sam markets, when obviously the she metal can uses much more aluminun

Cliff Sands, Alcoa manager of rig container sales, says the paper-foil ca must be researched and developed, eve at the expense of sheet metal cans, b cause the foil-laminated body is th most economical to make.

In other words, the aluminum cor panies are facing an economic realit They are trying to create a cannin market with a long-range bright futu for aluminum rather than grabbing c big poundage for a few years then se ing it dwindle—along with can-make and packers' faith in the producers— cheaper containers are developed.

A futuristic foil application shown Ekco-Alcoa Containers Inc., Wheelin

■ *Tear-top can ends being developed by Alcoa either open can entirely (above) or convert can into a dispenser (at left).*

is a pouch which can be hermeti- sealed to preserve fresh foods and ks, or foods which have been freeze- ydrated. The bags serve as both the f container and the utensil in which foods are cooked.

ouches will be able to hold charcoal led steaks, bacon, shrimp cocktail, etables and other dehydrated foods. this new process, the foods retain to 100% of their original flavor, ms Ekco-Alcoa.

oil's vigor in the packaging field pointed up by Alcoa's recent de- on to re-enter the printed foil field, Reynolds' announcement of the ilability of 72-inch wide foil.

lcoa has hooked up with R. R. nnelley & Sons Co., giant Chicago nter, who is constructing a new fa- y just to print foil for Alcoa.

eynolds' wide-coil foil was developed ake advantage of the efficiencies of e laminating facilities. The firm the wide coil will be used mostly oducing cartons, corrugated boxes, ti-wall bags and barrier materials. wo other areas that are expected e profitable for sheet aluminum are apsible tubes and tear-off can ends. ording to the Collapsible Tube nufacturers Council, aluminum now unts for about 60% of their pro- tion. Consumption has grown stead- in the past few years; reached about illion pounds in 1960.

ds Could Use 250,000 Tons

If all cans had tear-off tops," says f Sands, "more than 500 million nds of aluminum would be re- ed per year to satisfy demands." his statistic has spurred Alcoa's de- opment of tear-off ends for use on minum, tinplate or foil-paper cans. e top was first introduced last year the Providence test and caused ugh favorable comment for Alcoa tart building prototype equipment. ear tops may be produced in many es. The original has a small tab ch, when lifted and pulled, rips out in scored strip of metal from the 's circumference. In another top a ngular-shaped opening is torn out. er shapes include tear-drop and moon—each providing the best ning for a particular product.

ear-tops for cans with inside diame- of 2⅜ and 3⅞ inches are being duced by Central States Can Co., ssilon, Ohio. These have a tab on side which, when yanked, pulls al away from the seam joining the with the body. The cap can be re- ed for storage.

he Canco Division of American Co., New York, is the latest to e out with a tear-top. It isn't in duction though; was just recently ket tested in Indiana.

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Double Duty Analyzer

Direct reading spectrograph at Wyman-Gordon Co is capable of making high-speed determination with conventional heads; then, fast change-over readies unit for photographic analysis.

METAL fabricators have long recognized the benefits of modern spectroscopy when properly combined with traditional methods of wet chemistry for metals analysis. The spectrochemical methods are usually quicker, simpler, lest costly over the long run, and less liable to error.

The Wyman-Gordon Co., North Grafton, Mass., has gone a step further in capitalizing on this equipment. The company uses a Baird-Atomic Research Direct Reading Spectrograph in the dual capacity of a photographic and a direct reading instrument. Direct readout is used for fast quality control analysis of incoming raw material; photographic analysis is used for non-routine or special analysis.

Founded in 1883, Wyman-Gordon has grown from a small forging enterprise to three giant plants in Harvey, Ill., Worcester and North Grafton, Mass.

The North Grafton plant, operated for the Air Force, has the greatest combined press capacity in the world. Presses range in capacity from 7000 tons to 50,000 tons. Together with the Worcester plant, it produces a larger volume and variety of aircraft forgings than any other plant in the world.

It produces such forgings as fuselage frames in aluminum; landing wheels in magnesium; piston engine crankshafts in steel; turbine wheels in nickel-base alloy; missile re-entry shields in copper; titanium missile cones; and many other products.

Such critical forgings produced to rigid specifications demanded the highest degree of quality control, especially of incoming raw materials. The usual wet chemical techniques were unsatisfactory for a number of reasons, but primarily because they were too slow or impractical.

The answer was found in the Research Direct Reading Spectrograph built by Baird-Atomic, Cambridge, Mass. This unit has several exclusive advantages, but the one most interesting to Wyman-Gordon is its versatility.

Because Wyman-Gordon processes a wide variety of alloys, it was important that the analytical instrument be able to handle a variety of problems. With the Baird-Atomic unit, one preset direct reading head can be used for aluminum alloys, another for magnesium, a third for nickel, and so on.

For non-routine or infrequent analysis, the instrument can be used photographically. Changeover requires onl 5 to 10 minutes. This exclusive featu of the B/A Research Direct Readin Spectrograph permits one instrumen in effect, to do the work of several.

The instrument handles about 90% of the analytical load of the Nort Grafton and Worcester plants. Althoug it is used only one shift a day, ove 5000 determinations are made on it pe month.

The most obvious advantages of th unit are its versatility and speed. As ca be expected, samples arrive at the la oratory in miscellaneous lots so tha volume of analysis varies considerabl from day to day. On a busy day, fo example, magnesium alloys may be an lyzed on a one-a-minute basis.

Since raw material quality and suppl is critical, and since time saved mean money saved, the unit has paid its wa handsomely, although no actual figure on savings are available.

When Running Beryllium . . .

An illustration of the versatility an capability of the instrument is its us at Wyman-Gordon for beryllium ana ysis. When this analytical requiremen first occurred, it was handled photo graphically because the volume of ana ysis was low and the specification as t the elements to be analyzed was co tinually changing.

As the work load increased and spec fications became more clear, the dire readout feature of the instrument wi used. For example, now one direct rea ing head is set up to analyze iron, co per, magnesium, aluminum and silico in the beryllium base material. In th near future, plans are to add other el ments in beryllium base when practica

Other infrequent analyses of bery lium base material — for example, ana ysis of 20 elements on a semi-quan tative visual basis — are performe photographically. It is believed that th is the first instrument performing dire reading analysis of beryllium base m terial.

Because of the toxicity of berylliu a special exhaust chamber is used minimize the hazards of working wi it. With wet chemical or similar tec niques, the toxicity of the metal wou present serious handling problems.

■ ***John Fipphen, chief spectrographer at Wyman-Gordon, prepares to insert sample in arc spark stand of Baird-Atomic Research Direct Reading Spectrograph.***

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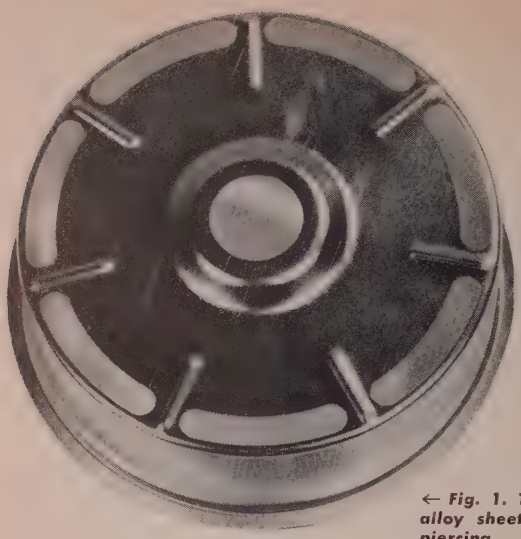


DEEP DRAWING MAGNESIUM
at mechanical press speeds

Experiments prove that magnesium sheet can be drawn on mechanical presses at higher speeds and lower temperatures than on hydraulic presses; that easily removed soap-type lubricants can be used; that greater depth of draw can be achieved than with steel or aluminum. Report based on paper given at Magnesium Association Meeting.

by E. V. Crane, E. W. Bliss Co., Canton 10, Ohio

← Fig. 1. Typical commercial stamping was deep drawn from .032-inch magnesium alloy sheet at rate of 35 strokes per minute. Part is shown after trimming and piercing.

SUCCESSFUL deep drawing of standard grades of magnesium alloy sheet at mechanical press speeds has demonstrated the fabricating utility of these materials, and extends magnesium's economic advantages to lightweight rigid components for automobiles and household goods.

This production fabrication of magnesium was the objective of an experimental program conducted jointly by the Dow Metal Products Co. and E. W. Bliss Co.

The weight saving and other advantages of magnesium had previously stimulated development of refining and rolling techniques for the metal. Limited requirements for fabricated articles had been met with the production rates and techniques of hydraulic presses.

As a builder of both hydraulic and mechanical presses, Bliss joined Dow in this project to show that the commonly available presses of the mass production industries are suitable for working magnesium.

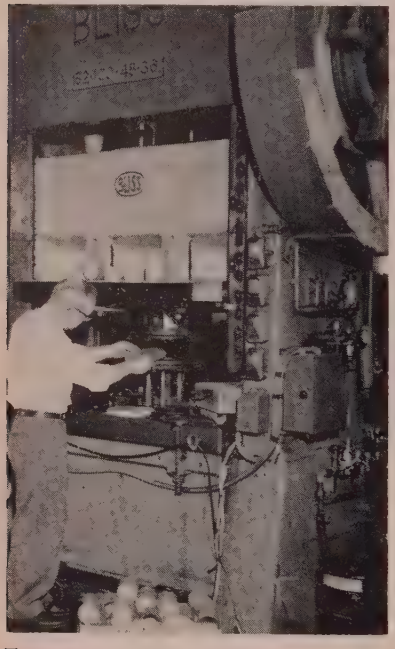
Draw Speeds: 20, 50, 80 fpm

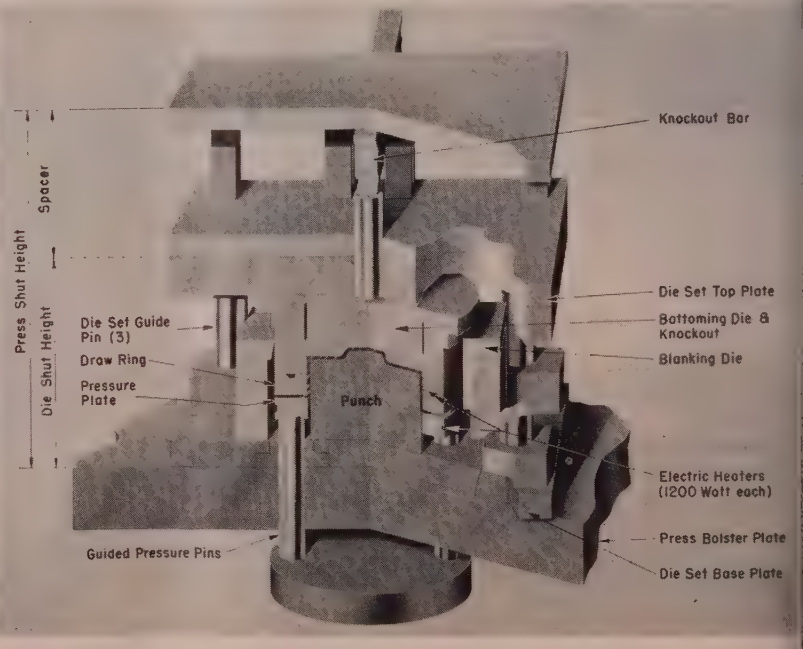
The project involved drawing ZE10A-0 and AZ31B-0 magnesium alloy sheet to different depths and at suitable temperatures, employing mechanical press production rates. A mid-stroke drawing speed of 50 feet per minute represented the normal production range.

The drawing of cylindrical shells under otherwise identical conditions at a low rate of 20 fpm and a high rate of 80 fpm provided a pattern for further extrapolation.

[A Dow metallurgist said that the project demonstrated that low cost magnesium sheet alloys can be drawn at speeds used for steel and aluminum, and that greater single stage draws (up to 59%) are possible than are recommended for either steel or aluminum. Moderate tool temperatures (400°F) eliminate the need for graphite and permit the use of soap-type dry film lubricants which require only a hot water rinse for their removal.

[Magnesium alloys can be given exceptionally deep single stage draws (up to 70%), but the draw speed must be low and the tem-





■ *Fig. 2. Press used in tests was a Bliss S2-100 straight sided unit with air cushion rated at 15.5 tons blank holding capacity at 100 psi. Dies were heated by radial cartridge heaters in blank holder and cushion ring, as illustrated.*

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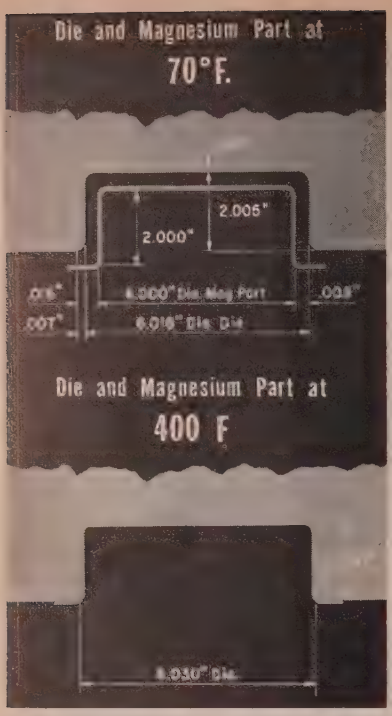


■ *Fig. 3. Thermal coefficients of expansion of both magnesium and steel must be considered when dimensioning dies used to draw magnesium at elevated temperature. Differences are shown here.*

perature so high as to require a graphite lubricant. This then dictates the use of a chemical treatment of the work in order to completely remove residual lubricant. —The Editor]

Figure 1 shows a typical magnesium commercial stamping. It was drawn in a mechanical press at a rate of 35 strokes per minute (50 fpm). Approximately 40% reduction in diameter was made at 400° F from .032-inch magnesium sheet in alloys AZ31B and ZE10A. This was worked out in the substitution of .032-inch magnesium for .025-inch steel. A weight saving of about 70% is realized.

Alloys Tested Include . . .

Readily worked ZE10A-0, ZE10A-H24 and AZ31B-0 alloys were compared for drawability under a series of standardized test conditions. Three-inch diameter cups were drawn from .064-inch magnesium sheet. The punch radius used was 10 times metal thickness (t) for one portion of the tests and 4 x t for another series. The draw die radius gave satisfactory results at 6t and 4t.

Blanks were prepared in quarter-inch increments of diameter from 3½ to 8 inches. These represented a draw ratio of blank diameter to cup diameter varying from 1.17 to 2.67, giving reductions from 14.3% to 62.5%. Groups of five blanks were drawn at each set of conditions, and success or failure (represented by typical fractures) was recorded.

Lubrication at all temperatures was Kerns 3833 Dry-Film, a dry soap type. Checking tests with graphite lubrication showed marginal if any contribution under the test conditions.

Press and Die Factors

A Bliss S2-100 straight sided double crank press (shown in Fig. 2) was used in this project. It is single geared and equipped with a CO-20-5 air cushion rated at 15.5 tons blank-holding capacity at 100 psi. The press was standard except that it was equipped for research purposes with a servo controlled electronic drive. This made it possible to run the series of tests at the crankpin speeds selected, which were approximately 20, 50 and 80 feet per minute.

The dies were heated by radially disposed cartridge heaters in the blank-holding members of the die and the cushion ring (see Fig. 2). The punch was not heated. Temperature was thermostatically controlled using Bristol on-off controllers with power stats to regulate power flow.

Temperatures used were 75°F (room temperature) for shallow forming reduction of 14%; 250°F for moderate draws (33% reduction): 400°F for deep draws (50% reduction); and 500°F for the exceptionally deep draws of which magnesium is capable. About 62% reduction was the maximum which the press stroke would permit, even with push-through operation.

For the purpose of the test, blanks were heated for one minute between magnesium heater plates in a platen heater at about 10° or 15° above the test temperature. This heating—the need for it, as well as its advantage—is of major interest to the potential industrial user of magnesium.

The design of dies for drawing at elevated temperatures must make allowance for thermal expansion of the dies as heated and for shrinkage of the stamping as it cools back to room temperature. Modern controls make it easy to hold temperatures steady.

The dimensions of the magnesium part as it is drawn at the elevated temperature required for the particular reduction involved are determined from the thermal coefficient of expansion of magnesium.

In order to have the steel dies at these same dimensions when they are warmed up to the desired temperature, it is necessary, when figuring their cold machining dimensions, to make allowances for the thermal coefficient of expansion of steel.

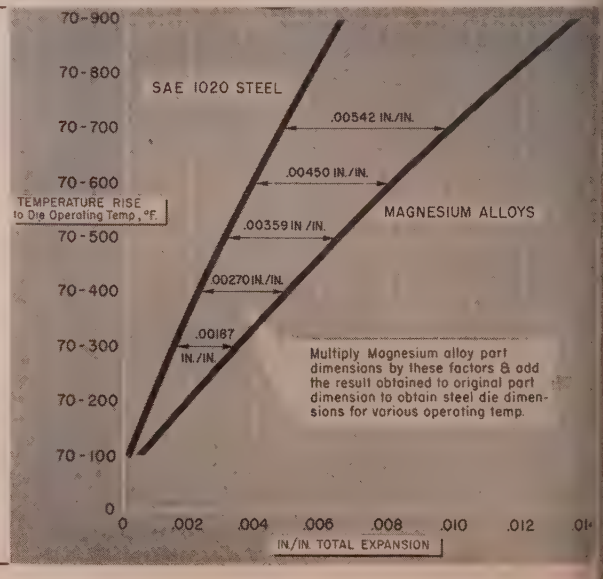
Figure 3 illustrates these differences, showing the cold dimensions of the stamping and of the die at the top, and their relation in the heated state at the bottom. The graph in Figure 4 shows the difference in dimensions between dies for drawing steel (cold), and dies for magnesium which are to be run at the appropriate operating temperature. Use of this graph saves calculating time.

Mag Work Hardens Faster

Magnesium is distinguished from the other commonly worked metals—the low alloys of iron, aluminum and copper—by the fact that it work hardens at a proportionately greater rate in the normal room temperature range. While this complicates the working procedure to some extent, it provides a clue to an asset of this rigid light metal.

Crystal structure is the key. The more complex relationship of atoms of magnesium (close packed hexagonal space lattice) makes it relatively more resistant to change of shape at normal ambient temperature ranges, and therefore more

■ *Fig. 4. Steel die design factors for tools used for hot forming of magnesium alloy parts. Use of this graph saves time, simplifies task of calculating dimensions of dies that are to be used at various operating temperatures.*



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SHEET	.010 24 x 120 — to — .190 60 x 180
PLATE	.250 36 x 96 — to — 6" 30 x 84
ROD	⅛" DIAM. — to — 8" DIAM.
SQUARE BAR	¼" — to — 6"
HEXAGONAL BAR	3/16" — to — 3"
RECTANGULAR BAR	⅛" x ½" — to — 6" x 10"
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valuable for structural stability in proportion to weight.

Ductility in the crystalline state is a low rate of work hardening attained by simpler and more mobile crystal structures. Magnesium has enough ductility to protect it from brittle failure in the ordinary wear and tear of usage.

But now that simpler metal heating methods and controls are readily available, full advantage may be taken of magnesium's remarkable combination of workability, structural rigidity and light weight.

Thermoplastic working is a modern term which seeks to describe the addition of enough thermal energy to atomic structural relationships to attain a desired plastic mobility. Thus, in the forging of a particular alloy steel shape, some temperature between 1800 and 2300° F may be the proper one to permit the desired change of shape and yet retain enough of the work hardening which accompanies change of shape to meet desired physicals and to rigidly hold the new shape.

Moderate Heat Used

Of course, severe working of magnesium alloys is performed at much more moderate temperatures. A man with suitable gloves may readily handle the heated blanks where that becomes necessary. There is no scaling problem, and oxidation barely discolors the surfaces.

Tests in the axial direction of the walls of magnesium cups drawn at 400° F showed yield points of 38,000 to 42,000 psi, and tensile strengths of 45,000 to 50,000 psi. Control of temperature to retain a suitable amount of work hardening takes advantage of the excellent characteristics of the magnesium crystal structure to obtain such high yield points.

This puts magnesium stampings in a strength-weight class by themselves, as compared with steel and aluminum.

Die Heating Methods

Blank holding members of dies, held at temperatures of 200° to 500°F may use either cartridge heaters or gas flame with thermostatic regulation. Heating capacity is conserved if the heated members are spaced apart on light sections from the relatively massive heat sink of the press bed and slide. Thermal insulation does not seem to be necessary.

For the heating of blanks, a variety of mass production methods suggest themselves. Coil stock might be fed through a heated chamber or between heated magnesium plates which are separated slightly during feeding. Blank heating would be varied with size and thickness. A minute of contact with hot plates may be favored when soap-type lubricant is used.

Table 1 presents figures on the drawability of the magnesium alloys tested. Per cent reduction and equivalent draw ratio (blank diameter to cup diameter) are shown at different temperatures.

The moderate effect of speed on drawability may be illustrated by considering alloy AZ31B-0, drawn at 400°F with punch and die radii of 10t and 6t respectively. The per cent reduction in diameter achieved reached 58.6% at 2 fpm, 57.1% at 50 fpm, and 53.8% a 80 fpm.

Two series of tests at 400°F are re ported to show that the difference i punch and die radius within the rang noted would not make any substantia difference. The larger radii are, c course, a little easier.

The exceptionally deep draws o which magnesium is capable have alway been intriguing. In the cold drawin of steel, aluminum and brass, a me chanical limitation at approximatel 50% reduction has been develope mathematically as an equivalence of th compressive unit stress in the flang area, and of the tensile yield strengt over the draw radius.

We might theorize that in the ho drawing of magnesium, the relativel cool punch chills the metal which is i tension, increasing its yield strengt sufficiently to enable the greater chang of shape in the flange area.

Big Asset: Deeper Draws

Whatever the reason may be, th results speak for themselves. The greate amount of reduction possible in a singl draw offers another production advan tage for the rigid light metal.

In conclusion, the remarkable struc tural rigidity in proportion to weigh in stamped magnesium components, de veloped at suitable and moderate work ing temperatures in drawing or form ing operations, is available for mass pro duction applications at the economica production rates of mechanical presse

Table 1: Drawability of Magnesium at Mechanical Press Speeds

Degrees F.	Note	Magnesium Alloy	Press Crankpin Velocities 20 fpm % Red.	20 fpm D/d	50 fpm % Red.	50 fpm D/d	80 fpm % Red.	80 fpm D/d
75°	(a)	ZE10A-0	25	1.33	20	1.25	(c)	(c)
		ZE10A-H24	14.3	1.17	14.3	1.17	(c)	(c)
		AZ31B-0	14.3	1.17	14.3	1.17	(c)	(c)
250°	(a)	ZE10A-0	33.3	1.5	33.3	1.5	(c)	(c)
		ZE10A-H24	30.3	1.42	25	1.33	(c)	(c)
		AZ31B-0	30.3	1.42	30.3	1.42	(c)	(c)
400°	(a)	ZE10A-0	57.1	2.33	53.8	2.17	53.8	2.17
		ZE10A-H24	58.6	2.42	58.6	2.42	(c)	(c)
		AZ31B-0	58.6	2.42	57.1	2.33	53.8	2.17
400°	(b)	ZE10A-0	57.1	2.33	53.8	2.17	(c)	(c)
		ZE10A-H24	57.1	2.33	55.6	2.25	(c)	(c)
		AZ31B-0	(c)	(c)	53.8	2.17	(c)	(c)
500°	(a)	ZE10A-0	62.5	2.67	62.5	2.67	(c)	(c)
		ZE10A-H24	58.6	2.42	58.6	2.42	(c)	(c)
		AZ31B-0	62.5	2.67	61.3	2.58	53.8	2.17

Notes:

(a) punch radius 10t, die radius 6t; (b) punch radius 4t; die radius 4t; (c) no tests were run
D/d=ratio of blank diameter to cup diameter
die diameter, d=3"; blank thickness, t=.064"

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PLYWOOD + ALUMINUM

A new industrial material, created by bonding flexible plywood to metal sheet, can be fabricated like metal; is already used in autos, appliances, furniture, etc.

by W. E. Poitras, General Manager,
Flexible Materials Division, U. S. Plywood Corp., Louisville, Ky.

A SUCCESSFUL and long awaited marriage has taken place between wood veneers and metal, and manufacturers of everything from automobiles to furniture are already taking advantage of the new material that combines the elegance of fine woods with the economy, durability and fabricating ease of metal.

The marriage was consummated by United States Plywood Corp. Combining the facilities of its Flexible Materials Division in Louisville, Ky., and its research center at Brewster, N. Y., U. S. Plywood developed a specially prepared wood veneer with backing, designed for lamination to flat or curved metal surfaces.

After being impregnated with chemicals and preflexed mechanically, the wood is completely pliable so that it can be laminated to metal and then formed, bent, pierced and shaped in much the same manner as sheet metal.

Tried It 30 Years Ago

Engineers, chemists and technicians in the wood and metal industries have been experimenting with various combinations of these two materials for over 30 years. Although raw wood veneers were laminated to metal as long as 20 years ago, results failed to meet the tests of time and wear. Adhesives were inferior by present-day standards, and the old lamination techniques were primitive.

Following those early failures, little was done in the field of wood-metal lamination until fairly recently.

By the early 1950's U. S. Plywood had built up a considerable market for Flexwood — a thin, natural wood wall covering that had found great favor with architects for covering curved and unusually shaped wall surfaces where flat paneling could not be used.

Preflexing of the veneers virtually eliminated the wood's tendency to split under extreme atmospheric changes, aging and other conditions.

Flexwood has a cloth backing material to give it stability and make it easier to handle. From there it was a sho step to the development of a speci backing material for application metal.

A specially developed catalytica converted plastic coating provides t finish for the wood surface and perm processing by standard sheet me punching, forming and cutting mach ery.

Result of all this research and perimentation is now known as Ind trial Flexwood. One-sixth of the 60,0 square foot U. S. Plywood producti facility in Louisville is devoted to tu ing out this product. Recently, an 11,0 square foot building was added Louisville specifically for the producti of more Industrial Flexwood.

■ ***Metal and Flexwood are brought together on a moving assembly line (photo at top of page) which leads to the laminating presses. The flexibility of the wood being handled is apparent. Photo above shows workmen spraying filling and sealing film on the wood-metal sheets prior to their being baked and stamped.***

Available in 3 Forms

Industrial Flexwood can be orde as:

1. Industrial Flexwood—wood ven for laminating to preformed shapes the customer's own plant;

2. Metal-backed Flexwood — a wo veneer, factory laminated to flat me sheets of any gage, ready for form and fabricating by the customer;

3. Finished parts, with Industr Flexwood permanently bonded at Flexible Materials Division plant to p formed shapes that the customer s plies. Such parts can also be fact finished to the customer's specificatio

Actual production of Industrial Fl wood begins with the selection by wood craftsman of properly grained a colored wood veneer flitches from

cpile of more than 4 million square
of veneer, acquired from many
s of the globe.

wood flitch is composed of the ve-
s from a single quarter section of
rticular log. These veneers, because
come from the same section of the
e tree, possess the same general grain
color characteristics. But no two
es of veneers are ever exactly iden-
.

ollowing the selection of closely
ched flitches, the individual veneers
trimmed and squared. They are
joined to the special backing ma-
al by highly skilled women who
k" the wood veneers in place to the
cing material with hand irons, while
fully inspecting each piece of veneer
imperfections and mismatching.

Wood and backing are next fed into
ress that welds them into a single
t. From there the sheet is conveyed
he flexing machines.

it Metal With Adhesive

Meanwhile, the sheets of aluminum
teel to which the Flexwood is to be
inated are being sprayed with a
ial adhesive. Then metal and Flex-
d are brought together at the be-
ning of a moving assembly line lead-
to the laminating presses.

The laminated wood-metal sheets are
n taken into a sanding room where
ne sanding removes any slight un-
ness that might have been produced
the laminating process. Sheets are
n sprayed with a filling and sealing
and baked in an oven which re-
es all excess moisture and assures
per penetration of the filler.

The filler and sealer-protected sheets
then taken to the sheet metal shop
re they are stamped, punched and
ned to the customer's exact specifi-
ons.

Although standard sheet metal form-
equipment can be used to process
sheets, specially engineered and de-
ed dies must be used in the stamp-
and punching operations to prevent
shing of the wood fibers at the cut-
g edges.

The punched and formed wood-metal
ces next arrive at a finishing room
ere they are edge-sanded to remove
rs. Then they are sprayed with a
cial catalytically converted plastic
ting, and finally baked and hand-
bed to a permanent, protective finish
master wood finishers.

Prior to being individually wrapped
shipment, each piece is examined
der a gloss meter to make sure that
finish meets the customer's specifi-
ions.

The production of Industrial Flex-
od products is not yet a fully auto-

■ ***Punched and formed Flexwood-on-metal pieces are sprayed with a specially-developed, catalytically converted plastic coating before baking and hand-rubbing so a permanent, protective finish is produced.***

mated, or even semi-automated, process. It is a combination of modern engineering, chemistry and technology, plus a large share of wood craftsmanship, all taking place under carefully controlled conditions.

Results of the entire process at U. S. Plywood's Louisville plant are currently on public display on the dashboard, glove compartment, and interior door panels of the 1961 Lincoln Continental, and in the kitchen cabinet-matching wood panels on General Electric and Amana refrigerator-freezers. A wide variety of other wood-metal laminate products are also on the market, including shades, poles and bases for lamps, chair backs and seats, drawers, screens, and decorative headboards.

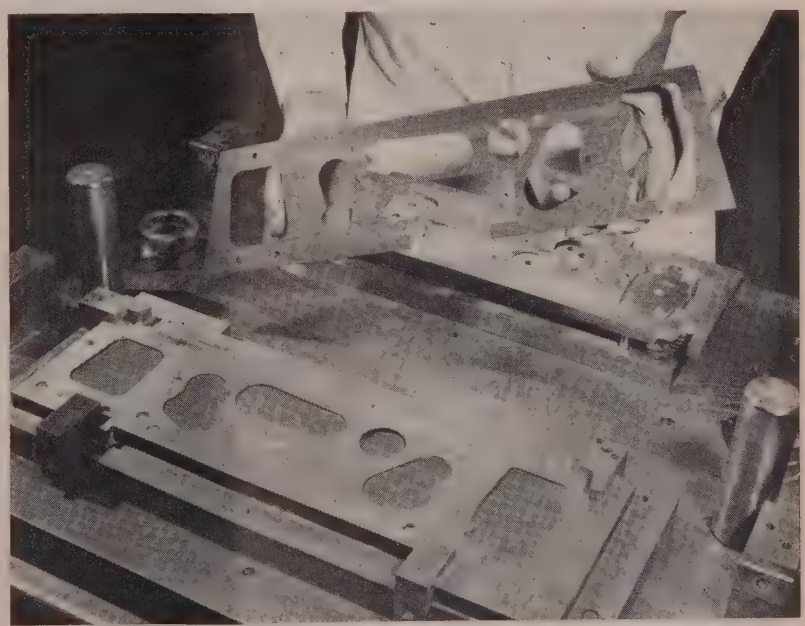
Metal-backed Flexwood-decorated appliances and office equipment, too, have the elegant appearance of fine wood furniture. And metal-backed Flexwood has passed the test for use on dryers, sewing machines, radio and television and phonograph cabinets, air conditioners, and exposed ducts and grilles.

Architectural Uses, Too

For many architectural purposes — beamed ceilings, fixtures, paneling with relief designs, fins, moldings, doors, and acoustical ceilings — metal-backed Flexwood offers unusual design possibilities to the architect. The owner also reaps the benefits of worthwhile economies.

For vehicles, railroad cars and aircraft — and for terminal interiors, too — Industrial Flexwood with metal, plastic, Fiberglas or other backings, permits durable, decorative treatments not otherwise available.

The trim sections on the Lincoln Continental use both aluminum and steel as substrate — aluminum for the door trim, and steel for the glove compartment and instrument panel. In both cases the metal substrate is .025-inch thick, while the wood veneers are .015 inch thick.



■ ***Dies that are specially engineered and designed must be used when stamping and punching the instrument panel of the 1961 Lincoln Continental. The dies prevent the wood fibers from being crushed at the cutting edges.***

Olin survey forecasts

ALUMINUM GAINS IN CURTAIN WALLS

Olin study reveals: Present and future curtain wall volume; trends in materials and design; tonnage of aluminum involved, now and in future; comparison of aluminum with other materials.

HALF a billion dollars worth of metal curtain walls were erected on all types of buildings in the U.S. in 1960, and they accounted for about 15% of the total exterior wall area installed last year. Something like 90% of the curtain wall framing (including windows) was extruded aluminum, adding up to some 44,000 tons of extrusions. Only about 20% of the panels were aluminum, consuming about 4500 tons of sheet.

Survey Findings, And . . .

These are a few of the findings of a survey conducted by the Marketing Research Department of Olin Aluminum, New York 22. Other findings:

- As late as four years ago, about 40 companies were making metal curtain wall materials, but only a few of them engineered, fabricated or installed whole wall systems. Today, at least 110 concerns are offering complete pre-engineered systems, and 30 to 40 firms are supplying materials to them.
- The average cost of metal curtain walls has dropped more than 30% in the last four years as marketing competition has increased and technology matured.
- The trend is toward development of more fully integrated wall systems, providing finished exterior and interior walls, some with built-in insulation, heating, electrical and plumbing systems.
- Nearly 70% of all curtain wall panels used were either porcelain enameled steel or structural glass, and panel coverage averaged about 40% of the curtain wall surface.
- If all non-residential buildings erected last year were clad in metal curtain walls, the total area would add up to some 500 to 600 million square feet. This compares with the estimat 82 million square feet of metal curta wall actually installed in 1960.

Olin's market researchers arrived these conclusions by interviewing large number of architects and curta wall fabricators," and by relati known data on non-residential constr tion to other facts.

"One such fact is that relatively fix ratios exist between exterior wall ar and floor areas for different buildi types, i.e., offices, schools, hospitals, etc the survey report explained. "Th ratios were determined by analyzi actual wall and floor areas in proje using curtain walls. By applying ratios to total floor area constructed reliable estimate of potential total c tain wall area was obtained."

The interviews with architects a fabricators served to determine the p centage of curtain wall to total w construction in different types of bu ings. The Olin study found that of buildings use the highest percentage curtain walls; industrial plants lowest.

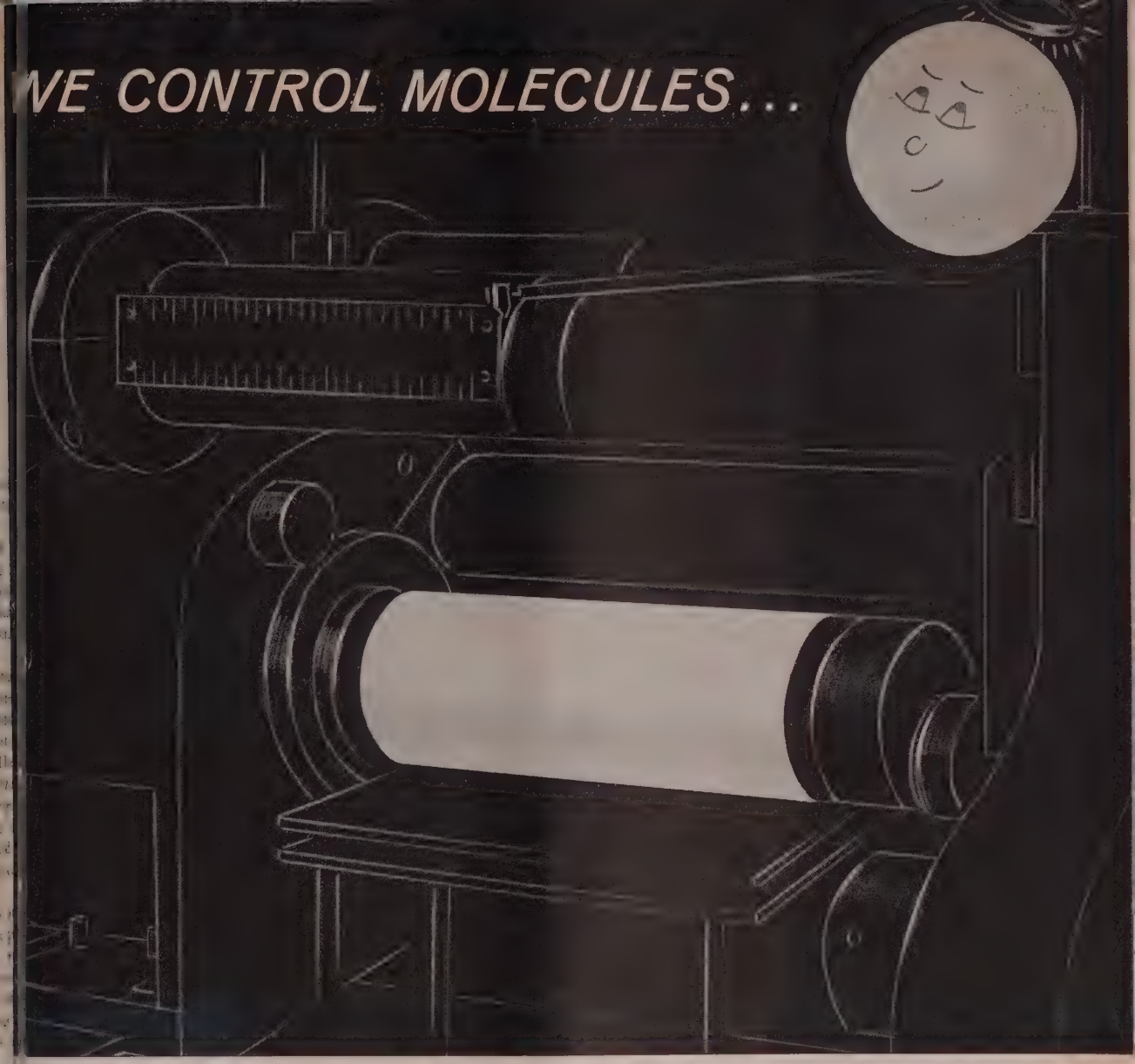
"These and several other factors w combined to arrive at an overall 1 figure for current metal curtain w usage in non-residential constructio the report added. (This 15% estim does not include industrial siding j using corrugated sheet or other form panels without framing.)

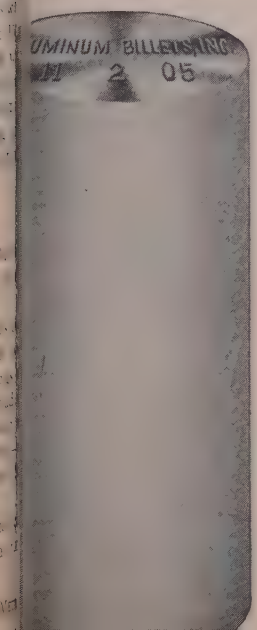
. . . Some Predictions

Projecting its findings, the Ma Research Department came up with following forecasts:

- If present construction trends tinue, 25% of the total outside area of all non-residential buildings ing erected by 1963 will be clad i metal curtain walls. This will add to some 158 million square feet - increase of nearly 92.7% over the total.
- The in-place value of metal tain walls will reach an annual

■ *Typical metal curtain wall — on the Nassau County Courthouse, Mineola, N. Y., has framing of aluminum extrusions and porcelain enameled panels.*





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of $800 million by the end of 1963 — a 60% increase over the 1960 total.

- Use of aluminum (primarily extrusions) in framing will slip slightly from 90% in 1960 to 87% in 1963, but actual consumption in this application will rise nearly 60% to 70,000 tons annually.
- Total use of aluminum in curtain wall panels will rise from 20% in 1960 to 28% in '63. Breaking this down, plain and anodized aluminum will increase from 12% in '60 to 13% in '63, while porcelain enameled aluminum will jump from 8% to 15%.
- Use of porcelain enameled steel in panels will drop from 43% in 1960 to 24% in '63, while glass panels will decline from 25% to 24%.
- Stainless steel's share of the curtain wall panel market will rise moderately from 6% in 1960 to 9% in '63, but the greatest percentage gain (from 6% to 15%) will be registered by materials such as ceramic tile, cement asbestos, marble, and the like.

'All Offer Aluminum Frames'

Noting that "all metal curtain wall manufacturers now offer aluminum framing systems," the report pointed out that an average of 1.2 pounds of aluminum extrusions went into each square foot of curtain wall last year. The principal application was in 4 to 6-inch mullions.

"Within the last several years," the report added, "a tendency toward fixed window frames in curtain walls has become apparent, especially in high rise buildings. If continued, this trend would affect total aluminum demand since operating windows would be eliminated and only mullions used."

On the other hand, the report noted, many architects and owners prefer operating windows, especially the reversible pivoting type that is easy to clean. "At the moment the trend is unpredictable," Olin's researchers said.

Competition from stainless steel does not look too serious to the Olin group. "Stainless steel frames have been more expensive than aluminum," the report explained, "and the metal is not as easily extruded and formed . . . although improvements in high velocity extruding and forming may change the picture."

Cast Concrete Poses Threat

Precast concrete panels, the material specified for the giant Pan Am Building in New York — to be the world's biggest office building — are a potential threat. The 5 by 12 foot concrete panels are butted into each other without metal framing. Window openings will be filled with aluminum reversible windows.

"Growth in this type of curtain wall obviously would result in less aluminum used in framing," Olin's report concedes. "However, despite the masonry and concrete industries' intense efforts to prevent further penetration by metal curtain walls, the total curtain wall market will probably grow faster than the rate of penetration by any one competitor, thus insuring an increasing volume of business for all materials . . ."

Porcelain enamel finishes should enhance aluminum's position in the curtain wall panel business, according to Olin. "Architects are looking at porcelain enameled aluminum panels with growing favor because the edges need no protection against corrosion as in the case of porcelain enameled steel, and the costs are competitive," the report explained.

Noting that porcelain also adheres better to aluminum than to steel, the Olin group pointed out that "this results in much less likelihood of spalling and better chip resistance. If chipping does occur, no progressive spalling will ensue."

Porcelain Relieves Monotony

Also favoring porcelain is "the growing resistance among architects to the monotony of contemporary curtain wall jobs . . . Porcelain enameled aluminum curtain wall panels with textured designs offer pleasing esthetic variations which provide relief from the rather staid and uninspired appearance (of) most conventional c tain wall systems."

Another factor in aluminum's fav according to the Olin study, is the velopment of laminated and insula core panels with lighter gauge (.020 .050-inch) facing material. "In th lighter gauges the cost difference tween aluminum and steel is minimi since all other costs in producing la nated panels are about the same reg less of facing material used."

Further detailing the matter of m curtain wall costs, the Olin study fo that they range between $3.50 and $ 00 per square foot, completely stalled with glass.

"In 1957 the average wall cost six new metal-faced buildings in N York was $9.47 per square foot," cording to the report. "Improveme in design, engineering, fabrication erection have reduced metal curt wall costs since then to a current a age level of $6.50 a square foot as c pared with about $6 per square for standard masonry walls.

"When ultimate costs are compa taking into consideration long-t savings, metal curtain walls usually less than masonry," the report asser

Average Costs Today . . .

Some average current costs of m curtain systems using aluminum fra and different panel materials were ed in the report as follows:

Panel Material	Cost per Sq.
Aluminum	$6.00— 7.(
Stainless (mill surface)	6.50 —7.5
Stainless (polished)	9.00—10.(
Porcelain enameled steel	5.50— 6.5

Commenting on the "at least companies that offer complete pre gineered metal curtain wall syste the Olin report noted that "Man these firms originally made alumi windows for residential and comme buildings, but then branched into al curtain walls as demand for products mushroomed. There are other 150 companies furnishing pa sealants, and other components to industry."

Growth of Curtain Wall Volume and Aluminum's Role in the Market

Year	Total Non-Residential Wall Area	Total Curtain Wall Area	% Curtain Wall	Framing		Panels	
				% in Alum.	Thousands of pounds	% in Alum.	Thousand of pound
	Thousands of square feet						
1959	536,000	70,000	13%	90%	84,000	16%	9,0(
1960	563,000	82,000	15	90	88,000	20	9,0(
1961	585,000	105,000	18	88	110,000	23	14,0(
1962	610,000	134,000	22	88	125,000	25	18,0(
1963	630,000	158,000	25	87	140,000	28	25,0(

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News Products and People

Army's New Tank Is Tougher, Safer, More Maneuverable

The M-60, newest medium tank in the U. S. Army's array of heavy weapons, is an improvement over the M-48A2 medium tank because it packs a bigger wallop, has a greater cruising range and provides better protection for the crew. All this is accomplished without an increase in weight by using aluminum instead of steel for certain components.

Pictured above is an aluminum fuel cell for the M-60, shown hanging near one of these new tanks. Two of these 650-pound units go into an M-60 and chop 1000 pounds off the tank's overall weight. The all-welded units also eliminated special treatments that would have been required to keep steel tanks from rusting. Lennox Industries, Columbus, Ohio collaborated with Reynolds Metals Co. on this fuel cell design.

Other major applications of aluminum (160, all told) in the M-60 include aluminum wheels, basket, ammunition racks and some of the armor plate. The weight saving permitted installation of a 105mm gun, replacing the 90mm used in the M48A2.

Henry L. Clark, Chrysler general superintendent of tank production (left), observes the fuel cell with Frank P. Adair and Wilbur W. Neds, of Lennox, and Chrysler's William Smith.

Magnesium's Versatility To Be Stressed in Big Campaign

Magnesium has more advantages than merely the quality of weight saving, and this fact is to be pointed out in no uncertain terms to engineering and design personnel throughout the U. S. The Magnesium Association has a promotional campaign ready to go which it is hoped will stimulate new interest in the metal by pointing out advantages other than its lightness.

Frank Sheara, chairman of the Association's Public Information and Education Committee and vice president of Magnesium Elektron Inc., New York, said the campaign will employ technical data sheets, each stressing a single application, post card mailings, and a quarterly paper, "Magnesium in Motion."

"Too great stress has been laid upon the light weight feature and not enough on magnesium's many other important qualities which have caused its widespread acceptance for electronics and space applications and for structural uses in the automotive, materials handling and printing industries among many others," Sheara explained.

As has been done at past Association meetings, the Magnesium Association's 17th annual convention, scheduled to be held October 16, 17 and 18 at the Belmont Plaza Hotel in New York, will have an exhibit of "101 Commercial Uses of Magnesium," which will serve to focus attention upon the multiplicity of uses in various industries.

"We're not so naive as to believe we can change industries over night," Sheara said, "but we do believe that until something dramatic is undertaken, there can be little hope for dramatic reaction."

Convention theme will be "Magnesium in Focus" with program papers discussing applications and technical developments which have focused attention on magnesium in the past year.

The Association is actively seeking unique, or at least less widely known, commercial applications of magnesium for inclusion in the "101 Uses." Such information should be forwarded to Jerry Singleton, executive secretary, at 122 E. 42nd St., New York 17.

Test Tells Effectiveness Of Anodized Auto Trim

A new test to determine the corrosi resistance of anodized aluminum terior auto trim has been developed Ford Motor Co., Dearborn, Mich. T testing process is called FACT (Fo Anodized Aluminum Corrosion Tes

The test is said to be a rapid a practical electro-chemical procedure measure the corrosion resistance parts such as grilles, moldings and he lamp housings. It has been adopted all Ford suppliers of trim parts.

Ford says the test provides results minutes rather than in hours or da as required by most conventional me ods presently used, so it may read be applied to mass production process

The test was devised by manufact ing development engineers of the Fo Manufacturing Staff. A small elect lytic cell containing a corrosive ag is placed in contact with the surface an auto part. The subsequent resistan to a mild electrical current is measur during a three-minute period in wh corrosion of the coating is accelera and the insulating effectiveness of coating is determined.

A poorly protected part gives a re ing of 600 to 650, while a satisfacto protected part registers 750 or abo All production parts can be tested.

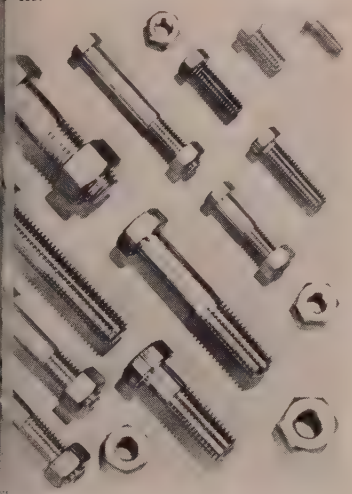
The test has been correlated clos with results of more than 2000 samp which were exposed during field t in the winter of 1959-60.

Giant Sand Casting Stron In Spite of Thin Walls

Successful casting of one of the lar aluminum alloy hydrodynamic st tures ever attempted, combining t wall dimensions with strength, is ported by the U. J. B. Foundry Pattern Co., Long Beach, Calif.

The requirement, growing out o research contract awarded by the Na Ordnance Test Station, China La Calif., called for a modified con structure 5½ feet high, 4 feet in ameter at the base, 2 feet in diamete

o, with a maximum wall thickness
inches.
gral bulkhead rings, stiffeners
nounting bosses required sections
g from .250 to 4 inches thick.
d casting was specified in the
original design as conceived by
OTS staff project group headed
chard DeMarco, project engineer.
es F. Sheetz, U.J.B. vice president-
said a new Type A.B. aluminum
developed by Uahib Brahim, pres-
of U.J.B., was a factor in the
s of the pouring. The cone, which
s 311 pounds, was poured in a
n-dioxide dry sand mold weighing
than 12,000 pounds.
liographic inspection of the cast
is being performed by General In-
on Laboratories, Los Angeles, to
nine its adherence to Navy speci-
ns.



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bronze and stainless steel fasteners
mplement its broad line of steel
non-metallic fasteners has been
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cially designed and conventional
ners are being developed from these
rials to meet the requirements for
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ight ratio and light weight needed
any modern applications.
uminum hex screws from 2024-T4
and hex nuts from 6061-T6 alloy
zes from ¼-inch through ¾-inch
eter are now being carried in stock.
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locknuts are also available from
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d, while stainless steel hex screws
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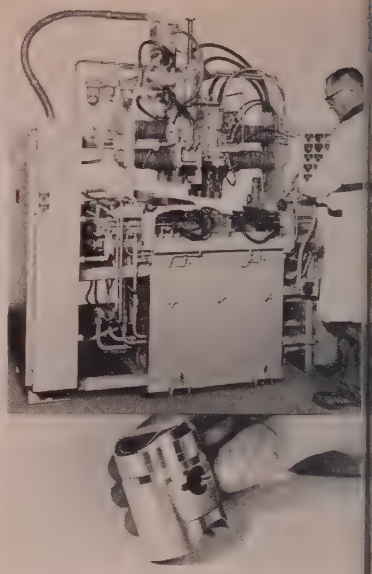
Grain Rolls
Chilled Rolls
Nickel Chilled Rolls
Moly Rolls
Nodular Iron Rolls

All Grades Nickel Alloy Iron Rolls for Hot and Cold Rolling

Hyde Park
FOUNDRY and MACHINE CO.
HYDE PARK
Westmoreland County, Pa.

Rolls
Rolling Mill Equipment
Gray Iron Castings

Machine Permanent Molds 240 Pistons an Hour



Two four-cavity universal automatically-cycled permanent molding machines for producing pistons up to 2¼ inches in diameter and at rates exceeding 240 per hour have been shipped from Permanent Mold Die Co., 2275 East Nine Mile Rd., Warren, Mich., to a Japanese motor vehicle manufacturer.

The machines will be used initially to produce aluminum motorcycle pistons with formed heads and measuring 1-¾ inches in diameter and 2-⅛ inches long.

The new piston molding machine is completely automatic except for pouring operations. One operator can easily run two machines side-by-side, simultaneously for a total production exceeding 480 pistons per hour. The production rate depends on such factors as alloy, pouring temperature, casting section and tooling design.

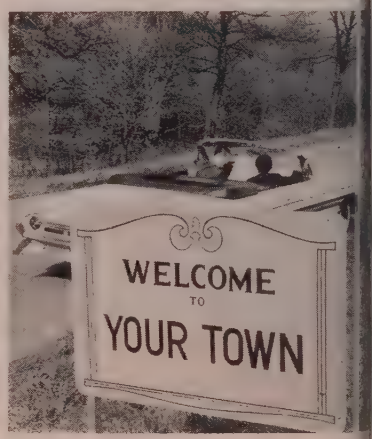
The automatic cycle includes assembly and disassembly of molds and cores and transfer of completed pistons from molds to a chute or conveyor belt. Transfer of the completed pistons is accomplished with a pneumatically operated overhead unloader. PMD says the machine is adaptable to changes in piston designs and sizes; tooling is designed for easy accessibility and simplified changing.

Molds, cores and head cores are air or water cooled; the machine operates with tooling and machine components at temperatures ranging from room temperature to 650°F.

A special interlock prevents mach operation if control buttons are pre out of sequence. This safety fea protects molds, cores, machine and p handling equipment from damag

Major machine movements are formed by hydraulic actuation. Sta ard hydraulic and electrical compon have been adapted for simplified m tenance and replacement, and standards are met throughout the chine, says the firm.

Alcoa Sign Program Aims to Clear Up Some Mysteries



As any motorist knows, a mystery town is any community which doesn't introduce itself by identifying signs at its borders. Aluminum Co. of America has a program going to help mystery towns out of their difficulties.

"Mystery Town, U.S.A." offers free aluminum highway signs, matching the one pictured (right), as a bonus to communities ordering other aluminum sign blanks or finished signs of Alcoa metal.

Municipalities will be entitled to one welcome sign at no cost, for each purchase of $500 worth of sign blanks, or $1000 worth of finished signs, up to a maximum of five free markers. City or county officials also will have an option to purchase additional welcome signs at a low cost after contracting for the free sign requirement.

The specially-designed welcome marker, ideal for thousands of communities now lacking proper roadside identification of any kind at their approaches, is on a three by two-foot panel of high strength aluminum. Sign metal thickness is .080. Alcoa uses 6061T6 alloy for these blanks. Printing is in two colors on imperial white "Scotch-lite" brand reflective sheeting for day-and-night visibility.

The signs are actually made by 30 Alcoa-appointed sign jobbers. make their own signs out of sheet others buy the blanks from Alcoa. that must be purchased include: signs, no parking, stop, curve, zone, dead end, etc. Stop signs street signs appear to be the bi markets, an Alcoa spokesman said.

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You're money, time and service ahead when you deal with SEAWAY because we paint our own products! This may not make "cents" to you but the following will.

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YOUR JOB IS BONDERIZED FOR LONGER LIFE: The Bonderite prepaint treatment assures a better paint bond, greater durability, increased corrosion resistance and increased resistance to flaking, crazing or chipping.

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THE METAL IS DUAL-SURFACE PAINTED FOR GREATER SPEED: Both sides of the metal can be painted in different colors at the same time according to your exact specifications.

WHAT'S MORE, we can paint acrylics, vinyls, alkyds or any modifications thereof; can roller coat widths of from 4 to 24 inches; aluminum thicknesses of from .010 to .050, steel from .006 to .040 and can handle any coil up to a 45 inch diameter or up to 4,000 pounds.

There is no newer equipment in the industry! You can't buy finer quality. And you get the fast, efficient service upon which SEAWAY customers have come to rely.

Why not let us bid on your next job. It can mean lower production costs and extra profits for you. Write, phone or send this coupon for further detalls.

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Outboard Motors to Use 50 Million Lbs. of Aluminum in '61

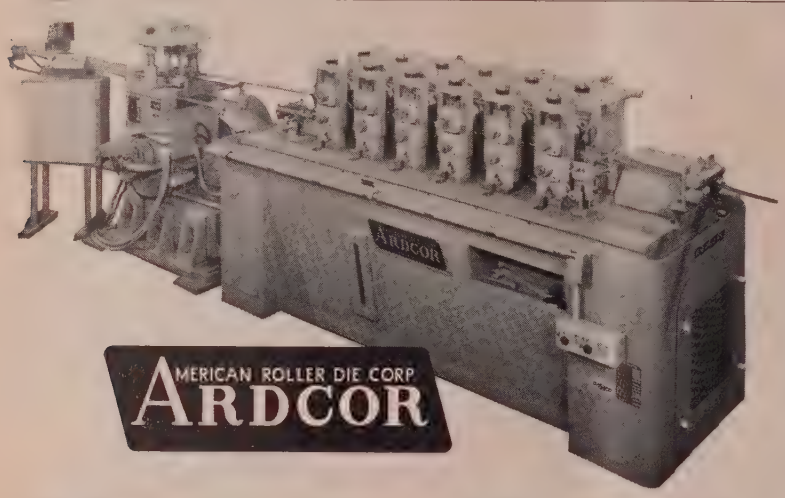
The throaty roar of more than half-a-million new outboard motors today is sweet music to motor builders — and to the aluminum industry which expects to supply 25,000 tons of the metal to motor makers, according to estimates made by W. D. Logan, Alcoa's manager of pleasure boat sales.

On the average, he indicates, 56% of an outboard motor's total weight — and more than 75% of its volume — is comprised of aluminum.

By 1965, predicts Alcoa, aluminum going into outboard engine blocks, heads, crankcases, stern brackets, propellers, pistons, housings, and screw machine products, will add up to a hefty 85 million pounds of the light metal.

While the 1961 motor crop easily will exceed 500,000 units, new boat starts will number about 300,000. The reason for the disparity, says Logan, is that sportsmen have found it much easier to rent boats than motors, so that many owners boast big outboards and no craft. Also, some boats run better with dual motors, mounted side by side.

Of the entire industry's 50-million-pound aluminum consumption, over 25 million pounds of aluminum will b utilized in outboard engine castin alone, says Logan, while the remai ing 25 million is destined for propeller housings, forged transom clamps an other smaller parts. Decorative shee for forward-mounted instrument panel is one of the faster growing uses.



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ARDCOR

"Rolling Your Own" CAN'T BE BEAT!

Not when it's on an ARDCOR Small Model "SF" Roll Forming Machine with a Model 10 ARDCOR Cut-Off Press.

There's no contest for low-cost, trouble-free production of small sections. An ARDCOR Model "SF" has all the fine engineering and sturdy construction features that have made ARDCOR'S larger Roll Forming Machines the top recognized producers in the field.

Roll formed shapes can be produced faster, better and at lower cost with ARDCOR Equipment. *Ask us for details and prices on single machines or complete production lines.*

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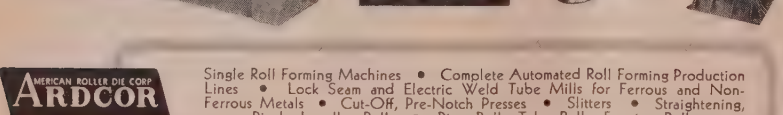

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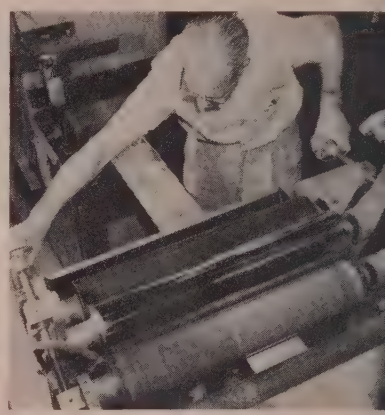
Single Roll Forming Machines • Complete Automated Roll Forming Production Lines • Lock Seam and Electric Weld Tube Mills for Ferrous and Non-Ferrous Metals • Cut-Off, Pre-Notch Presses • Slitters • Straightening, Pinch, Leveller Rolls • Pipe Rolls, Tube Rolls, Forming Rolls



Roller Speeds Application Of Conversion Coatings

Compact and simple are what Am chem Products Inc., Ambler, Pa., cal its roll coating method of applyin Alodine chemical conversion coating t aluminum coil used for awnings, sidin other building products and household appliances.

Up until now, chemical conversio coatings have been applied by brush ing, spraying or dipping. But Amche thought these methods required to much time and space, and worked o reducing both these production ele ments.

In October, 1960, Amchem installe its first commercial Alodine roll-coatin machine (above) at the plant of Alum roll Inc., Rutherford, N. J. The coate handles aluminum coil up to 24 inche wide at speeds of 150 fpm.

Although wash and rinse stages r main unchanged, the new roll-coatin stage, according to Amchem, saves ap proximately two-thirds of the floo space formerly required for the spray o dip stage, and reduces the time r quired for treatment with Alodine fro 15 to 5 seconds.

Only sufficient quantities of Alodin to wet the aluminum surface are r quired. The roller pressure determine amount of solution applied. The Al dine solution is never reused — elimina ing the need for chemical control of th bath or costly reactifying equipment remove harmful contaminants.

The new roll-coating method elim inates the cost and upkeep of pump and motors, nozzles and other spra equipment formerly required, and faster and more compact than dippin

insparent Foil Coatings me Clear and in Colors

line of brilliant coatings for alumi- foil called Stromiset has a con- tly growing list of consumer and in- rial applications, says its developer Foil Division of Revere Copper and ss Inc., New York.

hermally set, Stromiset coatings are isparent so the lustrous surface of foil beneath is reflected. Stromisets ie in many colors from light pastels deep blues, greens and reds. They said to be highly resistant to the nents, the sun's rays and to alcohol ning, neither water nor moderate osure to temperature variations af- s their surface.

tromisets may be bent, cut, flexed, ased or formed, and can be used in ariety of ways from large sheets to ost dust-like specks.

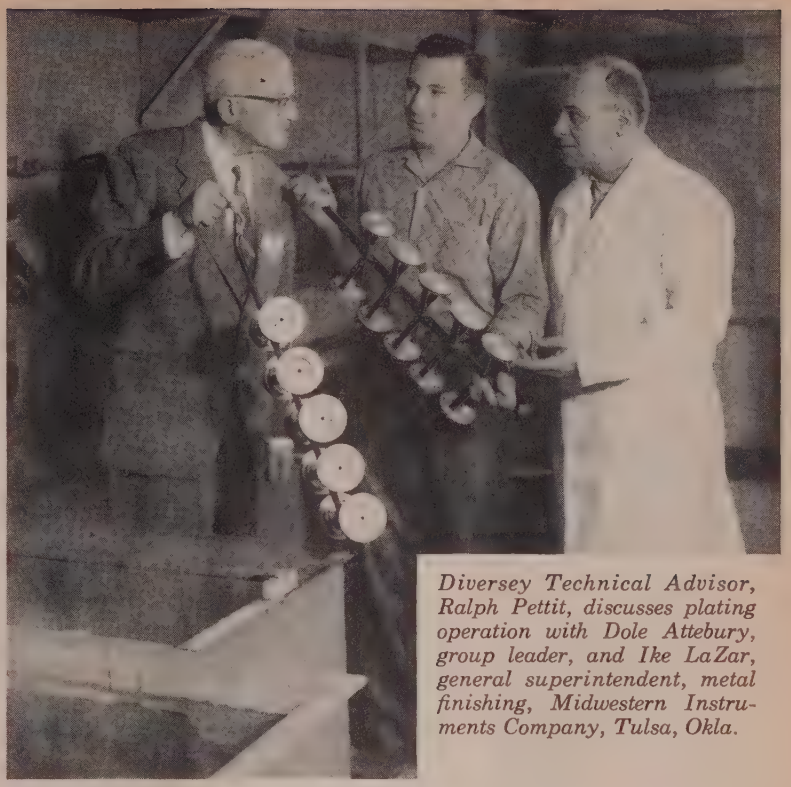
ome of the fields in which Stromiset tings are already used are advertis- displays, floor coverings, decorative l acoustical tile, greeting cards, pie tes and tart dishes.

ubing Cools Concrete /hen Building Big Dam

Chipped ice and 900 miles of alumi- m tube combine to play an important rt in the construction of giant Glen nyon Dam, rising at Page, Ariz., in canyon carved by the Colorado River. The tube, produced at Aluminum ompany of America's Lafayette (Ind.) orks, is being imbedded in the near- 5 million cubic yards of concrete re- uired to build the dam.

Water circulating through the tubing moves heat from the concrete, per- itting it to harden without cracking. rior to placing, the concrete is cooled the batching plant, by the addition chipped ice and chilled water.

When heat-removal no longer is nec- sary, the aluminum tubing will be lled with grout and left in the 710- ot-high bulwark. Installation is being erformed by National Mechanical ontractors, for dam-builder Merritt- hapman & Scott.



Diversey Technical Advisor, Ralph Pettit, discusses plating operation with Dole Attebury, group leader, and Ike LaZar, general superintendent, metal finishing, Midwestern Instruments Company, Tulsa, Okla.

Diversey helps plating experts stay that way

People at Midwestern Instruments Company are experts in the precision plating of instrument components. But they look for ways to do it better—to improve quality and cut costs.

Their Diversey D-Man helps. For example, he suggested switching to ZN-77, the new Diversey zincate immersion compound for plating on aluminum. The result: better plating quality, fewer rejects, and savings in time and materials. ZN-77 assures uniform coatings in a wider range of temperatures due to greater temperature tolerance; it saves 2 to 3 pounds of compound per gallon of water due to lower concentration requirement; it reduces drag-out with faster drain-off.

ZN-77 is but one of many production helps the Diversey D-Man brought to Midwestern Instruments Company. And it is just one of the many ways he might help boost your plating and finishing quality and reduce costs. He has the experience and a full line of metal-working cleaners and finishing products.

Call your local Diversey D-Man, or write

THE DIVERSEY CORPORATION
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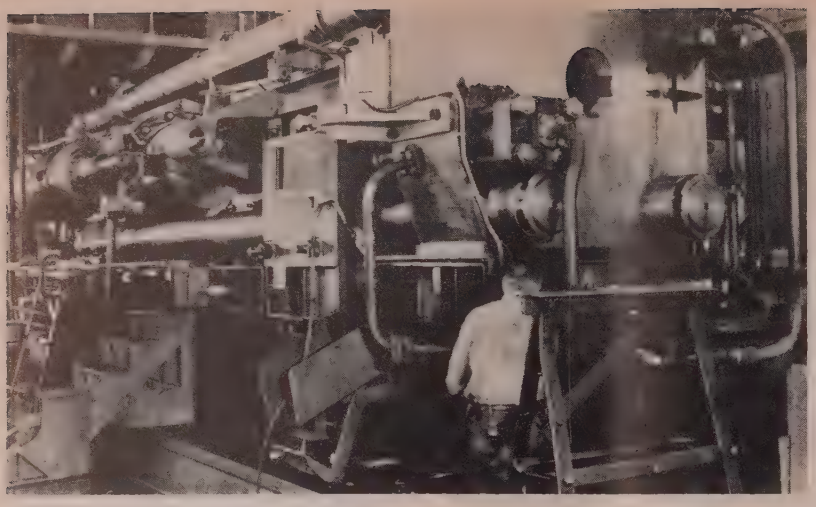


2600-Ton Extrusion Press Shipped to Switzerland

Big and versatile is what Baldwin-Lima-Hamilton Corp. calls the 2600-ton, oil-hydraulic extrusion press it just shipped to Aluminum-Laufen AG, of Laufen, Switzerland. The BLH Industrial Equipment Div'n in Eddystone, Pa., designed and built the huge unit.

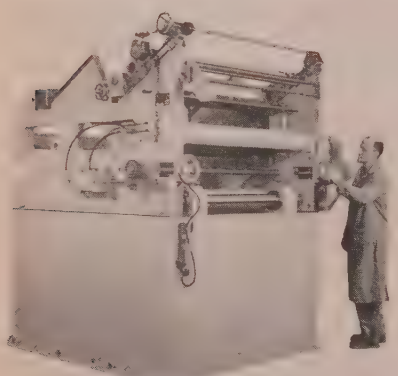
The press has a combination internal mandrel-manipulating, billet-piercing device and other features to permit extruding hollow sections in hard as well as soft aluminum alloys.

For high production rates on products requiring low press tonnages, main ram speed can be varied over a range from 0 to 61½ ipm. For speedy changeover to different products, special patented devices not described permit fast changing of the billet containers and the pressing stem.

Designed for semiautomatic control, the press also provides a transverse die slide for speedier die changes and faster cycling, and a long ram stroke for side-loading of billets, which can be up to 11-inches in diameter.

Photo shows press being pre-assembled for testing before shipment.

Finishing Line Roll Coats, Laminates, Embosses, Prints



A line of heavy-duty roller coating and laminating equipment which can run steel or aluminum coils up to 16 gauge by 48-inches wide has been developed by Faustel Inc., Butler, Wis. The line includes two and three roll coaters and laminator-embossers for thermoplastics.

The two roll or prime coater is capable of both direct or reverse roller coating for either top or bottom side application. It has special roller bearing gibs with adjustable wear take-ups which are said to remain accurate for many years. Each of the seven rollers operate through an individual variable speed synchronous motor drive with its own frequency regulator. Individual pneumatic throwoffs with positive return for all rollers are optional.

The three-roll coater or finish coater has all the features of the prime coater with the exception of an individually driven metering roll used for plastisol coatings or other materials not having sufficient flow characteristics.

One portion of the printing station employs an offset rotogravure process (photo). Here, the ink is first doctored off an etched steel rotogravure cylinder with a Mylar blade and then transferred to a rubber offset roll before coming into contact with the steel or aluminum strip. Side register control is effected by shifting the entire printer on 4-inch ball type slide bushings in response to an electric pick-up.

The standard printer also includes a flexographic printing head. Faustel believes this is the first complete roll-fed metal coating line using the offset rotogravure process operating on full production run.

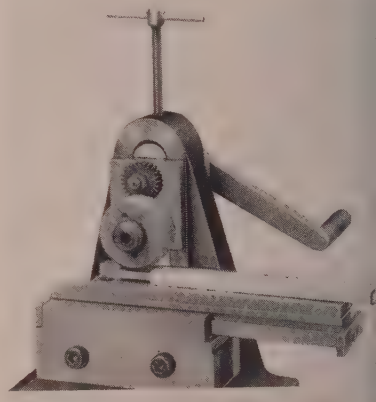
The final unit in the line can either emboss or laminate. Primarily used fo plastisols, the embosser section quickly converted to laminate all type of pre-printed films. This is done b substituting the hardened embossin roll with a synthetic roll. Nip pressur ranges up to 2½ tons on the wide models.

United Mill to Roll Big Beams for Japan Firm

A new mill for rolling what are ex pected to be the largest wide-flang beams ever produced has been ordere from United Engineering and Foundr Co., Pittsburgh 22, Pa., by Fuji Iron an Steel Co., Japan.

G. G. Beard, president of United, sa the mill will produce wide-flange bean up to 40 inches high as well as stand ard shapes.

"Innovations in the design of th mill will bring about reduced mill cost faster and semi-automatic roll change and quick switchover from wide-flang beam rolling to structural rolling claims United. The mill is expected t be completed and in operation la in 1962.



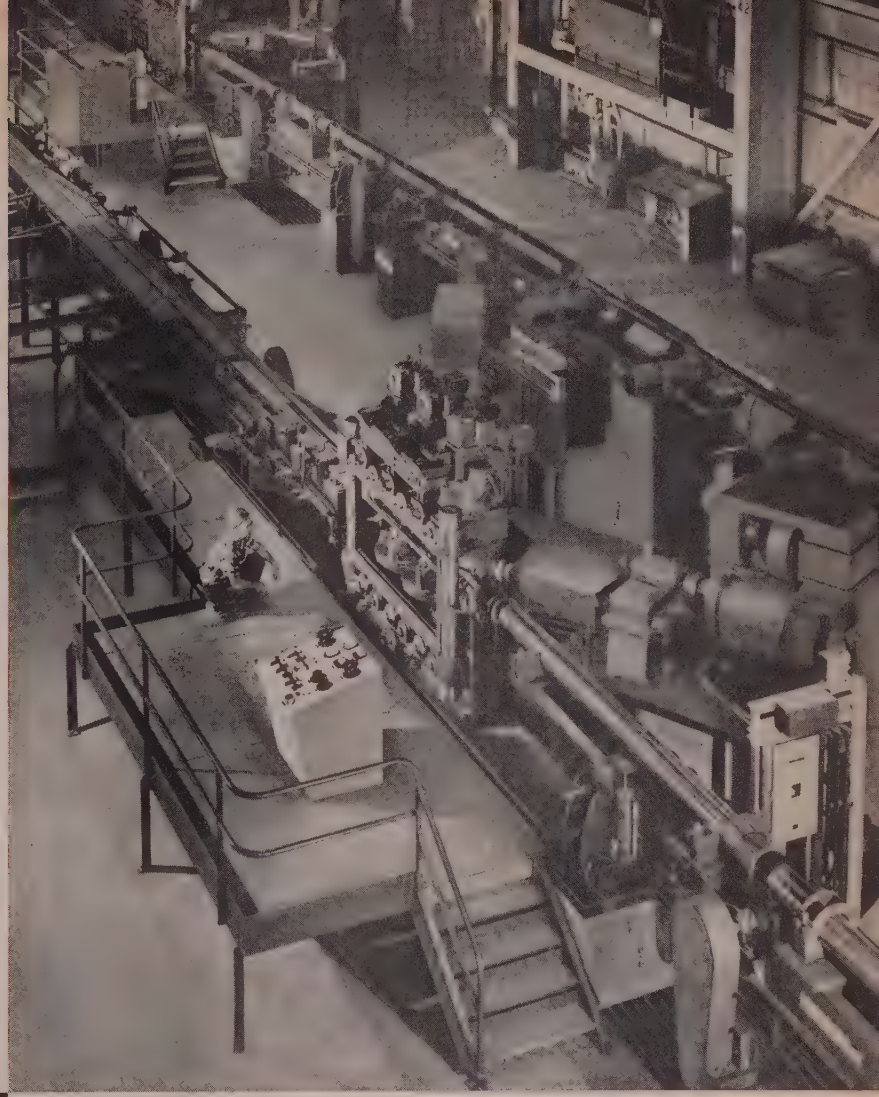
Fixture Marks Channels, Angles Without Distortion

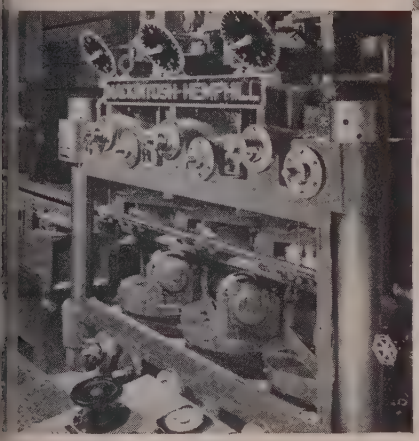
A special marking feature for identi fying aluminum channels, angles an shapes without distorting them has bee developed by M. E. Cunningham Co 1025 Chateau St., Pittsburgh 33, Pa.

The Style F marker is a table-mount ed fixture available in motor-driven o hand-operated models. The moto powered unit includes a solenoid-op erated clutch which allows the markin die to make a single revolution, the stop to accommodate the next part.

The Style F marker can include stationary mandrel to fill the channe opening, preventing deformation du ing marking. When marking extrude shapes, nesting bars can be furnishe to suit. Marking is accomplished by th fixture's passing the channel under rotating die.

hy Mack-Hemp straighteners were selected for the world's most modern ontinuous weld pipe mill





The new continuous pipe mill at Lorain Works of U.S. Steel's National Tube Division is probably the most productive facility of its kind in the world, exceeding the record-breaking pipe mill at Fairless Works.

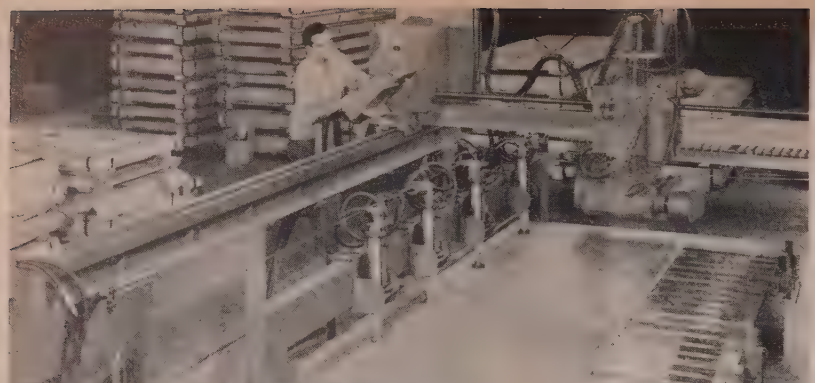
With straightness and roundness of delivered pipe more critical than ever, the Lorain Works assigns this important finishing task to two Mackintosh-Hemphill 6-roll guideless rotary straighteners. The two can process 1800 feet of pipe per minute. Finished pipe is perfectly straight and round, without spiral markings. "End hooks" at back and front are completely removed. Moreover, the straighteners' open three-post construction makes the rolls readily accessible, so that set-up time is cut to a minimum.

If you're concerned with straightening pipe or tube—no matter what the diameter or wall thickness—it will pay you to talk to Mack-Hemp. We have helpful information for you.

MACKINTOSH-HEMPHILL DIVISION PITTSBURGH U.S.A.

BLISS

ACKINTOSH-HEMPHILL
ivision of E. W. BLISS Company
Pittsburgh and Midland, Pa.



Saw Cuts 4-inch Thick Plates Up to 12 Feet Long

New equipment for saw cutting aluminum plate has been placed in operation at the Los Angeles plant of Joseph T. Ryerson & Son, Inc.

Made by Ty-Sa-Man Machine Co., 820 White Ave., Knoxville, Tenn., the machine has a capacity for cutting aluminum plate up to 4 inches thick, in sizes up to 6 feet wide by 12 feet long. Longer length plate can be handled under special arrangement.

The cut edges of aluminum plate sawed with the Ty-Sa-Man machine are smooth and clean, reports Ryerson. The machine also cuts aluminum plate to exact squareness, with parallel edges. Cutting tolerance is 1/32 inch; saw blade is carbide tipped.

Rust Builds Four Furnaces For Reynolds' Alloy Plant

Cast house capacity of Reynolds Metals Co.'s Alloy Plant at Sheffield, Ala., will be boosted by 30% with the addition of four furnaces designed and constructed by Rust Furnace Co., 930 Fort Duquesne Blvd., Pittsburgh 22.

Rust is building the furnaces as part of a $2½ million Reynolds expansion program; says that two of the furnaces are the largest of their type ever built for the United States aluminum industry.

These larger units are 80,000-pound capacity holding furnaces which will be paired with two 100,000-pound melting furnaces. These new melting furnaces will have a melting rate three times as fast as the plant's present furnaces.

To house the new furnaces and related equipment, a 175 by 140-foot extension is to be built on the present cast house. It will be approximately six stories high.

Direct chill casting units supplied by the big new holding furnaces will be able to cast ingots weighing up to 40,000 pounds each for use on the plant's immense aluminum rolling hot line.

Wellman Moves Facilities To Dow's Bay City Plant

The country's largest and most extensive aluminum and magnesium sand and permanent mold casting facilities have been moved by Wellman Bronze and Aluminum Co. from Cleveland to the former Dow Metal foundry in Bay City, Mich. Wellman leased the plant from Dow who, except for its custom casting laboratory in Midland, is completely out of the casting business (MM, Dec. '60, p. 79).

These moves doubtlessly will benefit the two companies and give the magnesium casting business in general a boost.

After moving into its new quarters Wellman expanded its aluminum casting capability by installing new melting furnaces and 25 new permanent molding units. Six such units for magnesium were also added.

Dan T. Wellman, president, says the new facilities "permit accelerated production activity from the largest to the smallest casting and in any volume."

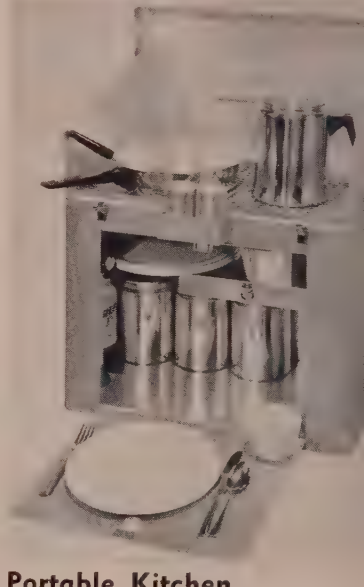
Wellman also announced recently that its 500 employees have completed over 2 million consecutive man-hours of work without a lost-time injury. Between 1956 and the present, Wellman employees have averaged 1.5 lost-time injuries per million man-hours, while U. S. Department of Labor statistics show the nonferrous average for this period to be 19.2 injuries.

Kaiser Completes Plant For Processing Can Stock

A fully-automatic facility to pro aluminum sheet and coil for the tion's can manufacturing industry been completed by Kaiser Alumin & Chemical Corp. at its Trentwo Wash., Works. It is said to be the of its type in the United States.

The over-all installation inclu multi-story high accumulators, 28 high tanks which contain up to gallons of degreasing solutions, tronic controls and x-ray installati to insure consistent quality.

The complete equipment is compo of a degreasing and flattening line coating line and a classifying line has been designed to finish alumin which has been hot and cold rolled can stock gauges from 7000 pound gots cast in the Trentwood mill. Cle ing, inspecting, flattening, coat trimming, shearing and packaging the metal in both coil and sheet fo are all done automatically.



Portable Kitchen Wrapped in Aluminum

Port-A-Camp Kitchen is an alumin unit which contains a stove, all cook utensils and eating equipment a which can be easily folded into a han lightweight carrying case and tra ported to fishing sites, picnic areas, e

The outer shell and lid of the ca ing case is of embossed aluminum 30 H154 sheet, while shelving and misc laneous stampings are in plain 3003-H sheet. All case joints are resistance sp welded and hinges and hardware riveted in place.

The stove is fired by propane taken from disposable cartridges.

The Port-a-Camp Kitchen is made Nichols Metals Mfg. Co., Inc., 31 Dodge Road, Kansas City 15, Kan.

Many profit-minded extruders are now extruding Alcan 50S HO as fast as their presses will run.

Here in one aluminum ingot...

much greater extrusion speed... plus good finish and strength

HEN you run Alcan 50S HO you get greater production . . . day and per machine-hour . . . while still maintaining good chanical properties and finish.

That sums up the experience of many fabricators now using s much-improved version of the long-time favorite Alcan S. They're unanimously enthused about its increased press eed . . . *up to maximum press capacity.*

Because of the all-around performance of Alcan 50S HO, ere is no longer any necessity for stocking a large variety of ingot products. This one ingot takes care of the majority of product runs. Alcan 50S HO Ingot can reduce your inventory as much as 60%.

Alcan of course supplies other types of extrusion ingot to meet special job requirements.

Run 50S HO on your own equipment . . . and clock your production on the run-out table.

For further information on Alcan 50S HO, write or phone your nearest Aluminium Limited Sales Office.

Aluminium Limited

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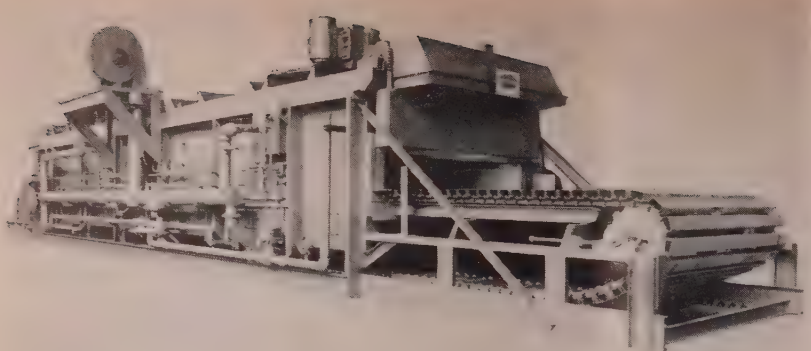


Continuous Draw Furnace Handles 1000 Lbs. an Hour

Continuous drawing furnaces which handle ferrous and nonferrous metals, and which come in gas-fired or electric models produce from 100 to 1000 pounds per hour according to Sunbeam Equipment Corp., Meadville, Pa.

Nine standard sizes are available with heating chambers ranging from 1 foot 4 inches wide by 8 inches high by 6 feet long to 3½ feet wide by 8 inches high by 16 feet long. Maximum temperature of the units is 1250°F.

Skin Mills Cut Intricate Patterns in Magnesium

Skin mills have been adapted for cutting small, intricate patterns in sheet magnesium—this usually accomplished by chemical milling—by Boeing Airplane Co., Seattle 24, Wash.

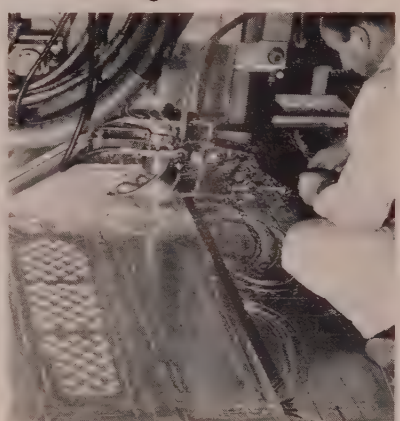
Skins for the Bomarc missile ramjet engine struts are carved in a waffle pattern on the underside to decrease the weight of the part without loss of structural strength. In early test models of the IM-99B, the advanced model of the surface-to-air Bomarc anti-aircraft missile now being built, the strut skins were produced by masking sheets of thoriated magnesium and etching them in vats of chemical solution.

In the production program, however, Boeing is milling the skins on a dual cutter skin mill at a savings of $283 a missile.

Conventional or manual machine milling on the criss-cross pattern was too costly. Even a highly skilled operator would be slow in contrast to the chemical process which can handle multiple parts. In addition, the high risk of human error could affect costs and production schedules. However, a cost analysis on fabricating the parts on a skin mill controlled by instructions from a magnetic tape (numerical control) showed that the machine milling price could be cut and the risk of error substantially reduced.

Dual cutters on the mill, in which a second cutter describes a mirror image of a numerically controlled cutter, further reduced the cost. Kearney & Trecker, 6800 W. National Ave., Milwaukee, supplied the mill.

Cost, however, was not the only consideration. Thoriated magnesium, desirable because of its high strength-to-weight ratio, offers certain hazards in machine milling not common to other



sheet metals. In the form of shavings or grindings, it is combustible.

To reduce fire hazard, machine operators are equipped with special protective clothing and shoe covers, and respirators. Readily available fire protection and fire fighting equipment is installed on or by the machine. Dust samples taken during machining were tested for radioactivity, but danger from this source proved negligible.

It has been found that machine milling of thoriated magnesium offers no special problems.

Bomarc engine strut skins are now in full production on the numerically controlled K & T skin mill. The vacuum chuck machine bed allows 16 parts to be placed in position at one time, cutting set-up time in half. The two cutter heads are cooled during milling by a spray mist emulsion of oil and water. An operator keeps the cutting area clear of shavings with a periodic blast from an air hose. Two cans of talc, especially effective in magnesium fire control, are readily available if needed.

Olin Expanding Omal Rolling Mill

Olin Mathieson Chemical Corp., N York, will spend "several million d lars" to expand its two-year-old Om Ohio, aluminum rolling mill.

New facilities to be added include 66-inch cold rolling mill for produci bright-finished sheet; a 36,000-squa foot building to house the new m and related equipment; another m stand to be added to the present h strip mill; more ingot heating faciliti automatic flying shear for cutting plat and auxiliary plate sawing, flatteni and inspection equipment.

Preliminary engineering is finishe detailed design work is underway a construction was to have started in Ju Some of the new facilities will be operation early next year and all a scheduled to be completed by the end 1962. The expanded plant will empl 960 persons, 20% more than now.

Bridgeport Brass Merges With National Distillers

Bridgeport Brass Co., Bridgepo Conn., a major manufacturer of n and fabricated nonferrous metal pr ucts, has become an operating divisi of National Distillers & Chemical Cor New York. The growing relationship tween metals and polyolefin plastics which National holds a leading positi was a major consideration in the me er, according to a joint statement John E. Bierwirth, chairman and Roy Coppedge, Jr., president of Natio and Austin R. Zender, president Bridgeport.

"There are many applications which polyethylene, National's princi chemical product, and metals are int changeable or where one can comp ment the other," the statement sa "Another area of interest is polyet lene-coated metals."

National Distillers has a stake in metals business through Reactive M als, Inc., a 60%-owned subsidiary wh produces and fabricates special me such as titanium and zirconium. T company has been managed by Brid port Brass since 1959. The merger sures that Reactive Metals will contin to have the benefit of this manageme

Bridgeport's Zender has joined tional's board of directors and is ch man of the executive committee; continues as president of the Bridgep Brass Div'n.

National exchanges 1.35 shares of common stock for each outstand share of Bridgeport common. As of April 17 record date, Bridgeport 1,518,498 shares of common stock o standing, calling for an exchange

)72 National Distillers common
. The 202,510 outstanding shares
dgeport Brass $50 preferred stock
e converted into equivalent shares
w National preferred stock.
a combined basis, sales of the
ompanies exceeded $720,000,000
ssests were more than $625,000,000
50.

ck Converts From Van Flat Bed Trailer

40-foot tandem axle open top van
r (bottom photo) built by Pike
er Co., 2615 S. Santa Fe Ave., Los
les, can be converted into a flat
nit in 20 minutes by removing the
inum side panels (top photo).
ıe unit can transport a wide variety
ommodities and equipment. For
ıple, it can haul 30 tons of heavy
inery one way and be assembled
van for hauling dry freight on the
n trip. Pike has delivered 40 of
onvertible rigs to Transcon Lines.
ıe seven-foot removable panels,
h, are stored in the front compart-
when not in use, are made of
aluminum alloy sheet and 6062 al-
xtrusions.
ading space in the van is 2,625
feet. Frame deflection under a
on load is 1-inch maximum. Empty
ht of complete unit as shown above
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Titanium Fan Withstands Wet, Corrosive Atmosphere

On January 15 a 49-inch titanium fan exhausting wet hydrochloric acid, ferric chloride, cupric chloride, and other extremely corrosive gases to a 120-foot stack went on stream. And within 15 weeks the fan had already paid for itself, and is continuing to pay for itself every 15 weeks, because a lifetime of service is expected from the new equipment, says Titanium Metals Corp. of America, 233 Broadway, New York 7.

Prior to titanium, carbon steel fans were used, but these failed in one week of operation. Each failure cost Nassau Smelting & Refining Co., at Tottenville on Staten Island, $1100. With the titanium fan and housing priced at $17,000, total costs were thus recovered in 15 weeks.

The rotary furnace, exhaust fan, housing and 120-foot stack are equipment Nassau uses to salvage polyvinyl-coated copper wire at the rate of from 75,000 to 100,000 pounds a day.

Revolving at 800 rpm, the titanium fan is capable of exhausting 20,000 cfm of gases. The fan weighs only 200 pounds, as compared with 425 pounds for the carbon steel fan it replaced.

Exhaust gases created by combustion of the copper wire insulation in the furnace contain hydrogen chloride and ferric and cupric chlorides. From the furnace they pass through a salt-water spray unit for cooling and scrubbing. The exhaust contains residual hydrochloric acid plus wet iron and copper salts. This atmosphere is cor enough to destroy ¼-inch stainless plate in a little over a week. Sho breakdown occur in this unit, fan be able to survive temperatures of than 700°F, boosting the atmos to an even more lethal corrosive

After testing many materials ir atmosphere, it was decided to tr titanium fan and housing. The 4 fan was fabricated by the Pfaudle Rochester, N. Y., of ⅛-inch con cially pure titanium sheet, with a also of titanium, measuring 5½ l inches. Photo above shows fan fro side rotary furnace exit before ins tion of the transition piece.

"Since installation, the fan and ing have more than lived up t expectations," reports Lewis Stoll, sau development engineer.

Men-on-the-move

Brooks & Perkins, Inc., Detroit, manufacturer of aerospace assemblies and light metals products for industry, has named **Edward H. Perkins,** Jr. as president. **Douglas S. Ferguson,** formerly sales manager of the mill and industrial products division, has been appointed general sales manager. **Donald L. Erickson** has been promoted from production manager to plant manager, Perkins announced.

Alfred F. Bauer, formerly assistant general manager of the Doehler-Jarvis Div'n of National Lead Co., has been appointed manager of the division. He came to D-J from The Dow Chemical Co., where he had been manager of the die casting department.

The Dow Metal Products Co., Div'n of the Dow Chemical Co., Midland, Mich., has promoted **Robert M. Keil** from district sales manager, Los Angeles, to magnesium mill products manager.

Appointment of **Fred H. Edgar** as division vice president-aluminum of the Metals Div'n was announc Olin Mathieson Chemical Corp. had been director of aluminum e sion operations.

Hilliard Y. Smuck has been n president of Quaker State Metals Lancaster, Pa. Quaker State is a sidiary of Howe Sound Co., New Smuck has served Quaker State as executive officer, general manager vice president for sales.

Reynolds Metals Co. has pro **George F. Voris** to regional sales motion manager for all products divisions of the Company in the c region, a ten-state area, with head ters in Chicago.

Earle W. Rearwin has been n president of Southern Die Casti Engineering, High Point, N. veteran of 24 years in the die c field and a leading authority o vanced die casting techniques, Re comes to Southern Die Casting Reed Prentice Div'n of Package chinery Co. He will, however, r on the engineering staff of Reed tice in an advisory capacity.

Financial Briefs

...t Nets More ...ewer Sales

...a's formula for heightened oper- efficiency must be sure-fire. The ...ny had about $10 million fewer ...n the second quarter of this year ...red with last, and came out with $2.5 million more in profits. ...l quarter sales of $211,294,020 $11,687,620, or 52 cents a com- share. For the same period last sales of $221,851,898 cleared a of $9,091,262, or 40 cents a share. ...s sales and operating revenues ...e first six months were $412,943,- ...ompared with $443,028,951 in the period of 1960.

...ey Reports Record Sales, ...ngs; Plans Expansion

...erations for the nine months end- ...une 30 produced record sales ...earnings for Harvey Aluminum, ...nce, Calif. Net sales for the period $65,820,247, compared to $42,627,- ...r the same period last year; it was ...me increase of 54.4%. Net income $5,075,258, equal to $1.07 per compared to $3,679,377 or 77 ...s a share for the like period in the ...ous year, based on 4,750,000 shares ...nding. Year for year, the profits ...was 37.9%. Harvey sold 1,000,000 of A Common stock last month, added $27,250,000 to the com- ...'s capital structure.

...big expansion program is getting ...d at Harvey. The company will an alumina plant of a size that ...natch its reduction operations, and ...develop its own bauxite mining ...es in various countries. Sheet and production facilities will also be Harvey recently acquired the U.S. ...nment extrusion plant in Adrian, (25,000 tons annual capacity), and ...amining the prospects for future ...sion overseas.

...er Has Good 2nd Quarter

...ser Aluminum & Chemical Corp.'s ...d quarter net was $7,109,000 on ...sales of $110,159,000; the same ...er last year produced earnings of ...),000 from sales of $103,175,000. ...quarter's earnings amounted to 39 ...a share after preferred dividends, ...on 15,027,222 shares outstanding, ...ared with 21 cents per share in ...based on 15,014,152 shares.

...neer Has Best First Half; ...cts Record Annual Sales

...e state of Kawneer Co.'s order ... suggests that its third quarter ... be as good as the first half of this ... which had record business. The first six months to June 30 produced sales of $20,584,941, and net earnings of $709,022 after Federal income tax, equivalent to 73 cents a share on 970,688 common shares outstanding. Sales for the 1960 period were $18,362,848 which netted $481,897 or 51 cents a share on 936,963 common shares then outstanding.

"Orders on hand indicate that our third quarter should show a good increase over last year's comparable three months," L. J. Plym, president, told stockholders. "On this basis it seems reasonable to expect that we should have a new high in sales for the full year."

Olin Reports Continuing Gains For Its Aluminum Operations

Olin Mathieson Chemical Corp. is hitting on all seven—divisions, that is. The big industrial complex reported "record sales for any single quarter and earnings 81.5% higher than the preceding quarter" in making it's half-yearly financial report. The consolidated statement had no details of the Olin Metals Div'n's achievements during this time other than to say that "the company's substantial aluminum inventory, accumulated when it first entered the industry, is rapidly being reduced to normal levels, and profits from this operation continue to improve."

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Looking Ahead

Up, up, up. Before you make out your 1961 tax return, government spending will probably have hit the $100 billion mark. There'll be more money spent on defense; no cut back in non-military spending. There'll be lots more money around come January; lots of new business; higher taxes. The dollar in your pocket will buy less. What some of the cool cats in Washington are trying to do is out-bluff that crazy Russian. They'll keep trying as long as the money lasts. All the talk about defending Berlin never mentions what the city is worth. If it's going to cost $15 to $25 billion to defend it over the next five years, why not put out bids for a new city? It might be cheaper. What the U. S. taxpayer should start considering is whether it's worth $200 to $300 per year of *his* money to keep the city on our side. But this is political; the type of conjecture that should be left for the "experts."

So look for a metalworking boom during the next two or three years. It will start with orders for military equipment, hardware and supplies, then transportation, electronics, machinery, instruments. And when these industries get going good, people will start buying more consumer durables than ever before. And they'll have to find a place to put them, so a new boom in housing (in the suburbs of the suburbs) will generate lots of steam. This will require heavy expansion of electrical facilities, which rounds out the picture.

As for aluminum, 1962 could easily be its biggest year. Ditto for magnesium, titanium, beryllium, lithium, plus any exotic alloys that may develop. You can already see military orders coming in from "way back when." Die shops are again busy quoting (frequently on the same job from several sources) for delivery next week. If half the orders firm up, the summer slump will be the briefest since World War II ended. One tool and die shop said if it got half the new orders it's been quoting on, business would boom for a year. So the stage is set for a boom.

Aluminum window and door makers better watch out. B. F. Goodrich has come up with a white rigid Koroseal (vinyl) aimed at the window and door market. This outfit has taken on 14 fabricators. from Maine to Nebraska, to produce and sell windows and doors made of the material. Claims are that it doesn't rust, rot, pit, warp, corrode; that it is resistant to scratching, denting, heat and cold, and does not "support combustion." Goodrich says its new product will compete for the $500 million annual storm window and door market – so, aside from the price-cutters, here's a new element to beware of.

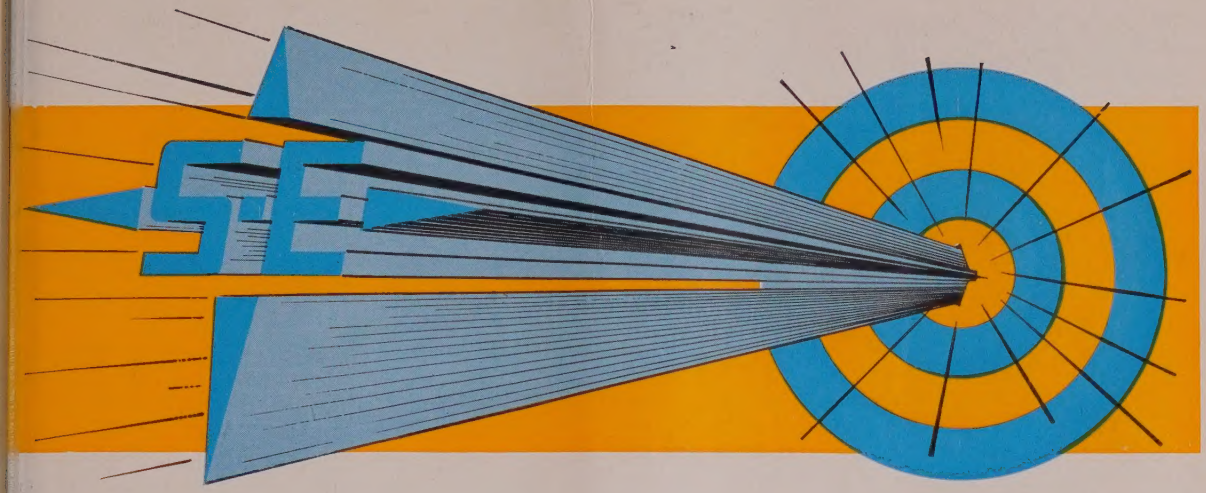
Construction and building have been rebounding at great rate. July was the biggest month in yea With new contracts for roads and streets bei let, August and September are a cinch to record months. Add new construction for mi tary establishments now getting underway, a this industry is in for one of its biggest yea Despite the groans of home builders, there is pickup in this industry, too. June and Ju housing starts were the highest in two years. it continues into the fall, 1961 starts could we reach the 1.4 million mark.

Building Sheet disappeared from the aluminum sce early this month – a scarcely lamented casual of the sweeping price changes which Alcoa p into effect August 1, coincident with a wage i crease amounting to 11.87 cents an hour. Alc termed the changes "minor" and said the impa on major markets would be of "small con quence." Essentially, the move was a simplific tion procedure that trimmed the Alcoa pri book from a massive 640 pages to a streamline 380. Product classifications were merged; ga and width brackets were broadened; many "e tras" were eliminated.

Prices of most tonnage products remained unchange Among the increases, the most significant w Type 3105 sheet – the replacement for Buildi Sheet. In coiled form, 3105 sheet is 1 to 2 cen higher than building sheet, the amount depen ing upon width. In flat form, the increa amounts to 2 to 3 cents. Some prices were r duced, reflecting Alcoa's study of its costs. E tra-wide 1100 alloy sheet, for example, unde went a price reduction of anywhere from abo 1.5 to nearly 5 cents a pound. On the oth hand, such items as mobile home sheet, abrasi tread plate and Anoclad sheet were raised sligh ly. To the industry as a whole, the new schedu will probably have less significance than will firming of prices, resulting from the curre strengthening of demand.

The specter of a tin shortage haunts the steel indust at a time when aluminum producers are incre ing their pressure on the canning market paring the price of container sheet. The pri of tin, spurred by mounting world-wide deman has soared about 17 cents to $1.17 a pound far this year. It started to level off this mont but demand still exceeds supply. Further i creases are a definite possibility – unless the go ernment gives in to steel industry pressures release some of the 6- to 8-year supply of t held in the stockpile. Even if GSA decided no to release some of the precious metal, it wou take months for it to finally hit the mark Meanwhile, aluminum producers are busily pe dling their 28-cent sheet to citrus concentra packers and any other can users who are willi to cash in on a good thing.

—The Edito



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